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WHAT THE UNIVERSITY EXPECTS OF THE SECONDARY SCHOOL[1]

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The high school exists primarily for its own sake; and secondarily as a preparatory school for college. This means that when the high-school interest and the college interest come into conflict, the college interest must yield. It also means that the function of a preparatory school must be performed only in so far as it does not interfere with the more fundamental purpose of the high school itself. It also means that independent dictation by colleges, either directly or indirectly, must be changed to adaptation to what the high schools can do and ought to do, as determined by the high schools themselves. The high school must be regarded as an autonomous, *not* a subordinate, institution.

Therefore, my real mission today is not so much to tell high schools what the university expects, as to ask from them what the university *ought* to expect. Any suggestion that I may make must be regarded as raising the question whether in your judgment it is reasonable. Two co-ordinate bodies are represented here, and they have met, not for mutual dictation, but for mutual agreement.

Since leaving a state institution fifteen years ago, I have had little occasion to visit high schools; but in the last few months

[1] Read at the Twenty-first Educational Conference of the Academies and High Schools in Relations with the University of Chicago, November, 1908.

I have had opportunity to renew my first-hand acquaintance with some of them. I recognized that during this interval we have been making tremendous progress in educational ideals and technique, and that in this general progress the high schools must have shared. I was not disappointed in this belief, for I discovered that in material equipment, in greater freedom and variety of work, in the closer articulation of work to the necessities and obligations of life, there has been very great progress. No student of education can fail to see in all this a genuine and most gratifying progress.

To formulate what the college expects from the high school, under these conditions of healthy growth, is as difficult as to formulate what one expects of a vigorous boy who is making a splendid record of physical, and intellectual, and spiritual progress. The expectation is simply that the same gratifying progress will continue.

Nevertheless, I shall speak to three topics, and the first is:

I. THE HISTORICAL SETTING

Why have we come together, and why do our interests ever conflict? Questions of entrance requirements, of examination or certificate, represent the historical tension line; to this may be added the advice freely given by university instructors to high-school instructors as to *what* they shall teach and *how* they shall teach it. The entrance requirements have constituted what universities call their "standards," concerning which I shall have something to say later. As a rule, the state universities have set these standards for the high schools; and, as a rule, the other universities, in self-defense, have followed them.

Universities, as a rule, are great store-houses of educational precedents, which have descended from mediaeval times, when there were very few subjects organized for study, and these few held little or no relation to the problems of intelligent living. They were the possession and pastime of a favored few. Heredity has filled the blood of most universities with this so-called scholastic spirit, so that they find it hard to adapt themselves to the new conditions. It should be remembered that the old selec-

tion of subjects was a matter of necessity rather than of choice; but since the opportunity for ample choice has come, the old necessity no longer exists, although it is the tendency of most universities to regard the older subjects and the older methods as possessing a peculiar relation to education.

On the other hand, the American school system is peculiarly a modern institution, developed out of the necessities of our own civilization, and seeking to meet the demands of the time. The schools are handicapped by no precedents, and have no heirloom rubbish to interpolate among their modern furniture. To the thoughtful student of education it is intensely interesting to watch the progress of the effort to articulate the very old, as represented by the universities, with the very new, as represented by the schools. It was necessary that it should lead to clashing opinions, and that the old and the new should scoff at one another. The old had the advantage of that dignity and influence which belongs to years and an honorable history; the new had the advantage of numbers and of public opinion. Neither could dictate to the other, although both wanted to. It is really quite remarkable that the two have gotten along so well together, and this argues well for the deep-rooted belief of each that it must have the other. In the main, however, the universities have imposed more upon the schools than they have conceded, as is very apt to be the case when the weight of educational authority is largely upon one side.

It is hard for the universities to lay aside the thought that the high schools are primarily preparatory schools. If this be conceded, then the universities must be permitted to dictate the courses of study. But it is not conceded, and still the universities have in effect dictated the courses. They have done it by making the entrance requirements so specific and so numerous that the four years of high school are absolutely filled with them. If there is anything for a high school to do beside preparing students for college, it either has no time for it or it is compelled to organize a separate and independent curriculum which does not lead to college. Most schools are so situated that they cannot do both. The colleges are honest in their opinion that their

entrance requirements represent the very best education for a student of that grade, whether he is to enter college or not. I have helped express and enforce this opinion, and so cannot be accused of any prejudice if I now venture to dissent from it. I still think that a large part of the university entrance requirement represents the very wisest subjects that can enter into the curriculum of the high school; but when these requirements become so large and so specific that they destroy the educational autonomy of the high school, and convert it into a university appendage, then I am constrained to dissent.

The increasing standards are to permit more advanced work in the university, and this is a magnificent purpose, to be encouraged by every true lover of education; but it must not be done at the expense of the schools, the great mass of whose students never enter the university. It is wise to introduce into the high school studies which may be of no special benefit to the pupil preparing for college, for they are of great benefit to the lives of those whose educational career must end with the high school. As I understand it, the high school is intended to train for better citizenship, to enlarge the opportunity for obtaining a better livelihood, to open broader views of life and its duties. In order to be of the greatest benefit to the greatest number, its course of study must be constructed as though there were to be no further formal education for the pupil. Subjects must be related to the needs of life and of society, but this need not and should not exclude those subjects or those methods which prepare and stimulate for further study; for there should be constant recognition of the fact that the secondary school is but an intermediate stage in educational progress.

II. THE UNIVERSITY EXPECTS GOOD TEACHING IN THE SECONDARY SCHOOL

There seems to be still a great deal of ineffective teaching in the secondary schools. That there may be no misunderstanding, I hasten to say that there is more poor teaching in universities than in secondary schools; and the larger the university, the larger does the percentage of poor teaching become. This would

be disastrous in higher education, were it not compensated for by the secondary schools, which turn over to the universities material that can stand the shock of a certain amount of poor teaching. There is an excuse for this in the universities which does not obtain in the high schools, and it is so evident that I do not need to specify it. There is all the more reason, therefore, that the high schools should bring the technique of teaching to its greatest efficiency.

I do not refer to the subject-matter or to the equipment of the school in material things, but simply to the contact of teacher and pupil in the act of teaching. We construct a well-ordered machine that runs smoothly, and then at the point of application often get no power, and the trouble is so subtle that correction seems almost impossible. To catch by observation the qualities of an effective teacher is like trying to catch a personality. For such a one no rules can be formulated. He is like the real artist, born with a feeling for his work. And yet there are certain obvious things that can be observed, and these ought to be helpful.

Perhaps the most difficult work of the teacher is to appreciate the exact mental condition of the pupil in reference to any subject. Unless there is complete adaptation in this regard, the contact is a failure, leading to mutual disgust and distrust.

In much of the teaching I have observed in the schools, the impression left upon me has been one of astonishing lack of simplicity and directness in the presentation of subjects, resulting in utter confusion. My own conclusion has been that this indicates either ignorance of the subject, or lack of teaching ability, or a wooden application of some pedagogical refinement which has been learned somewhere, and which is either not worth applying in any case, or is woefully misplaced. Hardly can there be imagined a worse combination than wooden teaching by one ignorant of the subject. In a great mass of teaching, instead of using clear expression and a direct presentation, the effort seems to be to use most unusual phrases, as far from an ordinary vocabulary as possible, and to approach the subject in such a devious way that its significance is in danger of being missed. The philosophy of teaching is well enough as a background, but

philosophical teaching is usually out of place. To inject the abstractions and phrase-making of normal training into the schoolroom is to dismiss clearness and all intellectual contact with pupils. This is no criticism of pedagogical training, for I would be the last to suggest that any profession should be attempted without professional training; but it is a criticism of those teachers who do not know how to apply their training, and follow what they regard to be rules, rather than principles.

Probably the greatest factor in this result is the fact that far too many teachers have learned more of the form of teaching than of the subject-matter to be taught. There is no flexibility, no power of adaptation, no ability to depart from a fixed routine, and hence no adjustment to the very diverse mental conditions they must meet and are expected to stimulate. Necessary flexibility in methods is impossible without a broad grasp of the subject to be presented. The amount of meaningless drudgery that this senseless formalism has forced upon pupils has long been recognized by parents, whose indignation occasionally breaks out in condemnation of the schools as places where method has run to seed.

It is very fortunate that the human mind is so tough a structure that it will develop in spite of teachers, and all of our educational experiments have not succeeded in sensibly stunting it. I have about concluded that the great problem in the act of teaching is not how to impart instruction, but how to oppose the fewest obstacles to mental development. The human mind has a mighty way of overcoming obstacles, but, as teachers, we have no right to attempt to make them insurmountable. I have almost cried out in indignation when witnessing some pupil whose quick mind has discovered short cuts to results, ruthlessly forced upon the procrustean bed of method by some teacher who knows only one way. It is such things that bring the profession into deserved contempt, as one that has not yet emerged from blind empiricism.

I know that this is imposing a tremendous burden of preparation upon teachers, but how is it to be avoided? In no part of educational work is flexibility in presentation and in material so

necessary as at its beginning. Truth is many-sided, and it is always a question as to which side shall be presented. The teacher who knows only one side is hopelessly lost, and hence becomes dogmatic and useless.

The whole situation results in a kind of paradox. If teachers develop such a grasp of the subject as to handle it with the greatest flexibility, will ordinary school positions content them? The question can be answered in only one way, and therefore we must come to this way sooner or later. The schools must be recognized as the greatest opportunity for *teaching,* as the universities are recognized as the greatest opportunity for *research;* and positions in the two must become equal in public esteem, in scholarly esteem, and in income.

The high schools have developed to the point where not only university training but often graduate training is demanded of the teachers. This is inevitable and desirable, for it will secure that grasp of the subject and facility in using it that has just been spoken of. It is to become increasingly true that the great field of our university masters and doctors is the high school; for they are becoming too numerous to provide for in any other way. Comparatively few of them can find places in universities and colleges; and most of those who do would be better off in good high schools. The lot of an assistant in a university or even of a professor in a small college is not so happy as it may look from the outside. In the former position, promotion is apt to be exasperatingly slow; while in the latter position it is impossible.

All this means that there is to be an increasingly large injection of university-trained men and women into the high schools, and on account of this we are confronted by a distinct educational danger. I have noticed a distinct tendency on the part of teachers so trained to transfer the methods of the university into the high schools, which goes so far, in some cases, as to duplicate the elementary courses of universities. In my judgment nothing could be more out of place in a high school, where the university atmosphere is a distinct disadvantage. There must be developed a clear understanding that the university training is to give to the high-school teacher a grasp of the subject, but not at all a

method of presentation. Such factors as the maturity of the pupil, the time at command, the size of classes, the purpose, all differ in the two cases, and presentation becomes a totally different problem.

I grant that it is easier to *repeat* a course than to *construct* one; but the teacher's problem is a constructive one, for it involves the power to *initiate* rather than the ability to *imitate*. It seems to be a hard lesson for university graduates to learn that a high school is not a college, and that it demands its own peculiar kind of teaching.

Naturally my attention has been directed especially to the instruction in science, and I have been amazed to see the large number of miniature college laboratories organized in high schools. The laboratories are well enough, but the courses given in them are too often college courses.

I recognize that probably no subject has been more discussed than science in secondary schools. School teachers and university teachers, in committees and conventions and addresses and periodicals, have wrestled with this problem. The school teachers knew their pupils and their facilities, but not too much about the subjects. The university teachers knew the subjects, but very little about the pupils, and still less about the facilities. It was hard for both to occupy the same standpoint, and both were inclined to be somewhat dogmatic, the university teacher perhaps a little the more so. School patrons, with their demands, have been a factor also.

The sciences are all in a state of extremely rapid evolution, and the schools are often finding themselves strangely at variance with the universities, and are plainly and repeatedly told that their science is an absurdity. These unpleasant statements are usually received with becoming meekness, as coming from those who are supposed to know, but they have led to nothing or to chaos.

This situation has been intensified by the numerous textbooks and laboratory guides, bearing the favorite legend "for high schools and colleges," and written by college men, from the college standpoint, which calculates upon time and equipment

and a reasonable amount of intellectual maturity. I must not be misunderstood, for I believe that these books are immensely useful, as keeping current the material and the point of view. My criticism is directed against the too slavish use of them. They are designed, or they ought to be designed, to simplify the problem of material for the teacher, but beyond that lies the teacher's own problem of presentation, which no one else can assume to solve.

In my judgment, therefore, there should be included in the preparation of the university graduate, who proposes to teach in the high schools, a study of the conditions and purposes of these schools, especially with reference to the difference in the factors entering into the educational ideals of high schools and of universities. Unless this is done, the majority of university graduates will attempt to repeat their university courses in the high schools. The minority are the born teachers, who adapt instruction to pupil and material instinctively, but they will always be in the minority.

The problem is in the hands of the secondary school teachers, for it cannot be solved by any schemes imposed upon them from the outside. They may look elsewhere for material and for suggestions; but the important features of the problem do not enter into the experience of the university instructor.

III. THE UNIVERSITY EXPECTS WELL-PREPARED STUDENTS

I have referred to the recent tendency among universities to increase their demands upon the schools; and this tendency, in my judgment, is full of danger for the schools.

It has long been my theory that the specific demands may be very few, and these so self-evident that a school would not be likely to omit them. What the universities need is not a specific kind of preparation, but a certain degree of intellectual development, a development which is usually much broader than that obtained from the average college preparation. I may be allowed to say, as the result of many years of experience, that this average college preparation presents to the universities the most narrow and unevenly trained material that can be imagined. Nowhere

are the evils of specialization so apparent as in the entrance preparation demanded by many colleges. If this specialization results in comparatively poor college material, its results may be regarded as simply disastrous to the high school in its primary purpose. This is not a plea for the multiplication of studies in the high schools, for one of their great weaknesses today is their tremendously congested condition. It is a plea for the relief of this congestion by reducing the university demands, not in quantity, but in specific assignment, leaving the schools freer to exercise their own judgment in the selection of special subjects.

The time has long passed when any aristocracy of subjects has any right to claim the privilege of standing guard over every avenue leading to a higher education. Any student who has successfully pursued a well-organized and coherent course for four years in a high school should be able to continue his work in the universities. There are differences of opinion as to what constitutes a well-organized and coherent course, but it could be outlined by principles rather than in detail, and the schools themselves should be responsible for its construction. A minimum of subjects and a maximum of time, continuous rather than scattered work, a range broad enough to touch upon all of the fundamental regions of work, methods that will secure precision in thought and expression, contact with the life and work of the times in which we are destined to live, are certainly principles that are sufficient, but concerning whose details none should dogmatize, for they may well vary with the teachers and with the local conditions.

The university should always be called upon for advice as to courses and methods, but it should be from the standpoint best determined by the schools themselves. For instance, I would not presume to dictate to any school the way in which botany must be taught; but I would count it a privilege, upon being made acquainted with the preparation of the teacher, and the facilities at command, to suggest certain lines of work from which, as a rational being knowing the conditions better than any one else, he could make his choice. I would regard it as my chief function to guard inexperience against waste of time and energy, rather

than to direct specifically. If the teacher does not know enough to make a choice in such matters, I would advise the selection of some other means of making a living. I must confess to being a great stickler for individual independence and responsibility, and that school or that teacher which is held in the dictatorial grasp of some higher authority that permits no expression of individualism in methods, which sternly represses all spontaneity and originality, which demands an automaton-like service, is pedagogically blighted. The vast machinery of the schools, which enters into every petty detail, rides them like the old man of the sea, and is converting schools into factories, and teachers into drudges.

And how shall well-prepared material be recognized at the university? Lately the entrance examination system has now and then thrust itself upon my attention afresh. I do not know whether this ghost of a dead past stalks into your educational banquets or not, but it is rampant in certain universities that rather pride themselves upon being haunted. A better scheme to show how not to do it was never devised. At the present day it is peculiar to the Chinese theory of education, and that nation should be allowed its exclusive use. It is both barbarous and unscientific. I would make no serious objection to its barbarity, if it were scientific, that is, if it obtained the information it seeks. What teacher does not recognize that the estimate of the ordinary examination must be tempered by knowledge of the daily work, or grave injustice may be done? How much greater the need of this tempering in the extraordinary entrance examination! If the tempering is necessary to obtain the facts, why not substitute the tempering entirely for the examination? Which means, of course, the substitution of the daily knowledge of the teacher for the ignorance of the university examiner. I wish no better evidence concerning the intellectual equipment of a candidate for entrance into a university than the judgment of the teachers with whom he has worked, for I can get no better, nor any other half so good.

It is strange that the universities are more concerned about their raw material than about their finished product. If they

would be a little less sensitive concerning entrance requirements, and a little more particular concerning graduation requirements, it might be a better expenditure of energy. It has always seemed to me that the fine-meshed sieve is set at the wrong end of the university.

I seem to have spoken for both the high school and the university. I feel that in spirit I belong to both. It may be that I am tempted to scold the university a little the more, because I know it better. It is the older brother, and it always irritates me to see it trying to impose upon the younger one. But *together* we are to establish an American system of education, not copied from ancient times or from other countries; but drawing from them all that is appropriate, and adding our own ideals, we are to meet conditions for which we find no precedent.

REPORT OF THE CONFERENCE COMMITTEE ON HIGH-SCHOOL ENGLISH[1]

JOHN M. CROWE
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Committee

The committee has understood that it was to give attention principally to the distribution and arrangement of work during the four years of the English course in the secondary school. It has also ventured, however, to outline certain suggestions concerning the course as a whole, which seem at the present time to have definite value. It has seemed fitting, also, to consider briefly the condition of the pupil on entering the secondary school. The report of the committee may be presented, therefore, in three parts.

I. *The Pupil's Training in English before He Enters the High School*

This should include

1. The power to read reasonably well, both orally and silently; to read seeingly and understandingly; to get the meaning from the printed or written sentence.
2. Considerable knowledge of good literature from reading. This reading should have been largely for interest, and so of easy and simple narrative. It may well have given a reasonably good acquaintance with American authors. It should have kept alive the interest in poetry for which the love of verse-sound and the picture-making faculty of children almost universally open the way.
3. The ability to write freely, naturally, and with reasonable correctness upon simple subjects in which the child is interested. This must result from frequent practice, with only the simplest and least technical knowledge of selection, proportion, and arrangement.
4. Knowledge of the most elementary and important facts of grammar, in logical and coherent form. This knowledge should include

[1] Read at the Twenty-first Educational Conference of the Academies and High Schools in Relations with the University of Chicago, November, 1908.

the forms of the sentence—its elements, the kinds of modifiers, the parts of speech—particularly case and the rules of agreement; also punctuation and capitalization. Grammar should have been studied as a help in understanding and making sentences, and not as a succession of puzzles in construction and analysis.

II. *General Features of the High-School Course*

1. The course should include a training in composition, with a reasonable amount of rhetorical theory; the reading and study of good literature; and a connected knowledge of the principal facts of the history of English literature. It may under certain conditions include a study of the science of grammar.
2. The amount of time required to accomplish all these ends should not be less than five recitation periods a week throughout the four years of the course.
3. As the powers of thought, expression, and literary appreciation are constantly developing in the pupil, side by side, so the training in composition and the study of literature should be continued side by side throughout the four years, with a gradual increase in the amount and difficulty of the work required. The practice of teaching composition and literature in alternate years, or alternate long periods, is educationally unsound. This mistake is most serious when the subject of composition is dropped permanently at the end of the first or the second year of the high-school course.
4. The course in composition and the theory of composition should receive not less than half the time assigned to English in each year of the course.
5. The course in composition should have as an end the ability of the pupil to speak and to write simple, natural prose with reasonable clearness, correctness, and force.
6. This ability, like every other acquired ability, must be gained through repeated careful practice, directed by an adequate and clearly understood theory, and illuminated by good example. Exercises in writing should therefore be constant throughout the course; such exercises should, in fact, constitute the course in composition, and all rhetorical theory and criticism should be directed to the effective and profitable performance of them. Exercises in oral composition are valuable in themselves, and as an aid to good writing.
7. Rhetoric should therefore be taught as good advice about the pupil's writing and speaking, applied directly to and illustrated by his compositions. The instruction should be confined to the clear

presentation and repeated application of the fundamental principles—unity, coherence, and emphasis—and to good diction.

8. The principal aim in the study of literature should be interest and enjoyment, leading to the love of and desire for good reading. Literature should therefore be presented to the pupil truthfully, as written for the pleasure of the reader, and not falsely, as a difficult task to be performed.

9. Real and lasting enjoyment of literature must be intelligent; the pupil should be required to have a reasonable knowledge of the character and meaning of what he reads, and should be trained to seek such knowledge in his future reading.

10. In view of the last consideration and others, a large part of the time given to literature should be devoted to the greatest English writers, and no time to those without real literary merit.

11. In view of the present tendency to read only fiction, and of the large number of pupils who will have no external incentive to reading after leaving high school, it is the duty of the high school to give the pupil some knowledge of the different forms of literature. A considerable part of the time should therefore be given to the study of the essay, the drama, and poetry.

12. A complete and coherent knowledge of the principal facts of the history of English literature should be given—preferably with the use of a textbook, but possibly without. Logically this part of the course should be placed in the last year. If, however, the great amount of time needed for the advanced work in composition and literature leave no room in the fourth year, the history of literature may be put in the third year.

III. *A Suggested Outline for the Work of the Different Years*

A. COMPOSITION

First year.—The preparation suggested in "I" cannot at present be assumed. The aim at first should be to remove the pupil's "inhibition." To this end (*a*) he should be led to regard written expression as merely a new form of a process already familiar. Therefore he should at first be asked to write, in general, as he talks, and about the same things; he should have frequent exercises in oral composition; he should think of the two forms of expression as easily interchangeable; (*b*) he should acquire familiarity with the act of writing, through almost constant practice; (*c*) he should be encouraged by commendation and suggestions for improvement; (c) he should be criticized principally for the interest and general effectiveness of his compositions, with attention to the general ideas of completeness, proportion,

and arrangement. Only gross errors in form should be corrected at first; a necessary review of the grammar involved in the pupil's mistakes may be given in the latter part of the year without interfering with freedom of expression. At the end of the year, the pupil should be able to write freely and naturally on subjects in which he is interested. He should be fairly free from mistakes in punctuation, capitalization, spelling, and grammar. He should have little or no knowledge of the technical rules and terms of rhetoric.

Second year.—Beginning with the power to write freely, the pupil should be taught to apply rhetorical principles to his compositions as units, and to their component parts, the paragraphs. This is the year for the study of development and organization of the theme. At the end, the pupil should be able to treat subjects fully, in unified, coherent, emphatic compositions, made up of unified, coherent, emphatic paragraphs.

Third year.—The work of the year should include a review of the whole composition and the paragraph; the new work of the year should be the study of the sentence—sentence building, grammar, the rhetorical principles of unity, coherence, and emphasis. At the end of the year, the pupil should be able to write well-developed and organized compositions in correct and effective sentences.

Fourth year.—The work should cover, in a way adapted to the maturity of the pupil, the whole ground of "preparatory" composition. The review of the whole composition, the paragraph, and the sentence is of the greatest value. The new subject of study should be the use of words—the number of words, the kind of words, the rules of good use. If time allows, a simple study may be made of the forms of discourse as such, particularly of argument and the writing of briefs in connection therewith.

B. LITERATURE

Four years.—The study should be based on the reading of "masterpieces" throughout the course, under the guidance of the teacher, with discussion in the classroom and recitations. The principal consideration in "placing" a book should be the ability of the pupil to understand and enjoy it; but the different forms of literature should be presented, and poetry should be part of the course in each year. The reading will naturally begin with narrative prose and poetry. Throughout the course outside reading should be encouraged, and to some extent directed by the instructor, but a part of the pupil's reading should be allowed to remain purely voluntary.

ELEMENTARY SCIENCE IN THE HIGH SCHOOL[1]

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A high-school course in elementary science is a thing so unusual that a justification of its existence fittingly precedes any discussion of what its content should be.

In the average high school of the present time the heavy requirements for graduation are for the study of English, languages, history, and mathematics—as everyone knows. Science, if required at all, is represented by a scanty year, in rare cases by two years, and sometimes, as in the school I represent, by but one half-year's work. The explanation of this limitation of science requirements is, as we all know, due largely to the character of the entrance requirements of our colleges and universities. Anything which the pupil gets beyond this required work he frequently has difficulty in crowding into his course because of the other studies which he must pursue in order to be able to enter, without condition, the college of his choice. The result of this state of affairs is that in many schools a large proportion of the graduates have never had any work in more than one science, and that in those where no requirement in science would exist were there no state law requiring physiology, pupils frequently are graduated without having had any other scientific work than that given in the course involving physiology.

In schools in which the requirement is small, it seems to some of us highly desirable that this requirement should consist of a semester's or a year's study of elementary science, which would include a certain amount of work in chemistry, physics, botany, and, if the law requires it, physiology; if not, zoölogy is to be preferred. In a year's work some of the elements of earth science might well be included. Such a course would make it

[1] Read at the Twenty-first Educational Conference of the Academies and High Schools in Relations with the University of Chicago, November, 1908.

possible to acquaint the boys and girls with certain basic scientific principles, and to give them a knowledge of at least a few of the most ordinary scientific phenomena.

In schools where the conditions are better and where two years of science are required for graduation, there is quite another argument for such a course, one which, however, holds good also for the schools of greater limitation; namely, that for the understanding of any physiology, plant or animal, and for effective work in physiography, there is necessary a certain amount of elementary chemistry and physics. For instance, when the evidences of respiration are to be studied, precious time will not have to be spent upon discovering the properties of the gases concerned, and by pupils who have for themselves obtained evidence that heat is energy of molecular motion, the evolution of heat during this process will be more readily understood and its value will be better appreciated. These same elementary facts and principles are as necessary for the understanding of physiographical processes as for intelligent comprehension of life-processes. In addition to the saving of time thus involved there is avoided a certain evil consequent upon teaching the chemical and physical facts just at the time when they are needed for understanding of some life-process. Presenting them as isolated facts at such times undoubtedly results in the pupil's obtaining a distorted perspective. These things should form a mental background, a magazine of knowledge upon which he can draw for aid in interpreting phenomena new to him.

If this work is properly done it can work no detriment to the student when he afterward elects an entire year of either physics or chemistry. (Indeed we have the witness of our instructor in chemistry that time is saved by it.) Moreover, the brief but pleasant taste of each of these subjects which he gets in the elementary work may be the means of arousing in him sufficient interest in them so that he will elect one or both to be a part of his course of study. This same argument is to be made for each of the other subjects presented in such a course. An interest in plants or animals may be engendered which will impel him to their further study. And if such interest is not aroused

and the youth departs from the high school without further scientific study, at least he will have been armed with the most elementary knowledge of the things and forces which surround him, and, I hold this no less important though I mention it so tardily, he will have received a little training in habits of accurate observation, of thinking to conclusions; he will have been led at least a few times into the attitude of scientific inquiry.

Such a course has been much experimented upon in the last few years in the Oak Park High School, and while it has not yet attained perfectly definite shape in all its parts, the evolution of the course is nearing its completion. Of course, no live course in science is ever absolutely defined, and it is to be hoped that the time will never come when this course will be rigidly outlined, but it has reached the place where its content is approximately determined.

It is given in the first year of the high-school course. No other science can be elected until credit in this course has been received. It runs throughout the year, each section meeting on alternate days. In this way each class has one double period for laboratory work and one single period for discussion and quizzing every week, and on alternate weeks two such recitation periods. This plan of separating the periods of instruction is especially good for that part of the work which is concerned with chemistry and physics, for, in those weeks so many new ideas, ideas rather difficult for him to grasp, are being presented to the child, that they must needs be fed to him somewhat slowly, in order that he may have time for digestion and assimilation of each in its own turn. Too great haste results in an attack of mental dyspepsia and utter inability to make use of any of the material. The very method of thinking is new. Too continuous exercise of this sort would weary him. His imagination also needs time to grow in.

The order of the subjects as at present outlined is, physics, chemistry, physiology, and botany. In the spring, before or in the midst of the botany, the life-history of the frog or the toad, and, at the end, the life-history of the mosquito are to be

introduced, these two studies being the only ones of a zoölogical nature.

The theory which underlies the main choice of topics in physics is that the molecular theory and the explanation of heat as energy of molecular motion are fundamentally important and that the pupil ought, therefore, to be acquainted with them. One exercise each is devoted to sound, light, and levers. Therefore, the course begins with an experiment in diffusion of liquids in which the diffusion is so obvious that the blindest of the pupils cannot fail to observe it. Parallel with this or following directly upon it, is given an equally obvious experiment in osmosis. In both experiments the pupils are carefully guided into making accurate and complete observations. Only the most phlegmatic of them fail to be astonished by the behavior of the fluids in both cases. When they have recorded their observations they are asked to explain what must be the structure of the fluids concerned if they can mingle in this way. By far the larger part of the class will always be ready with statements to the effect that the fluids must be made of very small particles; that since they have evidently passed through openings in the osmotic membrane which cannot be seen even with the microscope, they must themselves be exceedingly small. To the question of how particles which were in one place happen to be now in another when no external force has been applied, hesitatingly or contemptously, according to the personality of the individual, comes the reply "Why, they must be moving." "How much of the time do you think they are moving?" "All the time," for they see the diffusion keeping up day by day. And so they are given a name for the tiny particles of their theories and for the motion of the particles.

Next come experiments in diffusion of gases and effusion of gases, whereby the pupils are constrained to draw similar conclusions as to the molecular structure of gases and by comparison with the experiments with liquids, they come to realize that lighter molecules move more swiftly than heavy ones.

A repetition of the experiment in effusion of gases is now made with this difference. Instead of a jar of hydrogen being

placed over the porous cup, a jar of air is placed over it, and it is observed that there is no change in the position of the liquid in the manometer. Then hot air is forced by means of a bellows through a hot iron pipe into the jar. The effect upon the fluid is similar to that when hydrogen is used. Evidently the molecules of hot air move more rapidly than those of cold air. Heat is obviously the only explanation of the increased rate of the molecular motion. Experiments with air thermometers follow. Then experiments to show the expansion by heat of solids. Here then is introduced visible reason for concluding that solids also are molecular in their construction. Heat of vaporization and evolution of heat in solidification are now discovered by appropriate experiments with water and snow. The value of these experiments depends entirely, it is needless to say, upon the care with which pupils are guided in their observations and reasoning, and upon the skill with which class discussions are controlled. Atmospheric pressure is a topic very naturally introduced into this work, and appropriate investigation of the topic is made. One exercise is devoted to demonstrating that sound is produced by vibrations, and one is devoted to such experiments with light and such discussions as will enable the pupils better to understand the functioning of the parts of the eye when they reach the work in physiology. An exercise is also given in the study of levers, applications of the principles being made in the physiological work.

In chemistry, oxygen, hydrogen, nitrogen, carbon, carbon dioxide, sulphur, phosphorus, and iron are studied at first hand. These substances are chosen because of their direct relation to life, and the part which they play in metabolism. The meaning of oxidation and combustion is discovered. By painstaking reasoning from the observations in the laboratory, in the discussions in the recitation room some conception of chemical action is obtained. The composition of the air is demonstrated by a series of experiments in which oxygen is withdrawn from the atmosphere by rusting iron, and carbon dioxide by caustic potash. The synthesis of water having been observed in the combustion of hydrogen, analysis by means of electrolysis is demonstrated.

Acids and bases are examined and two neutralizations are performed. In connection with this work equations are made use of.

Throughout the work in chemistry and physics the greatest care is taken not to suggest to the class the truths which the experiments are designed to demonstrate, in order that the pupils may discover them for themselves and in order that their conclusions may not be warped by preconceived notions. For instance, when the experiments in diffusion and osmosis are set up, and the records of the apparatus and manipulation are made, the space for the topic is left vacant. After the observations have been made and the conclusion drawn the class is asked to suggest a topic, and it is really very interesting to hear them give appropriate titles.

With equal care they are led to follow up inferences with experiments to prove whether their inferences are correct. For instance, when they discover that gases expand in response to heat, they are sure to infer that liquids and solids will behave similarly, and experiments are performed to test the truth of these inferences. Of course, in this particular problem the exceptions are noted in the discussion.

From the work in chemistry they pass naturally to food testing. The teaching of the tests for each foodstuff affords excellent opportunity for insisting upon the scientific method of inquiry. No test is accepted as a test till it has been tried with each kind of foodstuff.

The work with foodstuffs immediately precedes the ten weeks' work in physiology in which the work deals with foods and digestion. Their previous work in heat and oxidation now comes into play most beautifully. With these studies for a mental background, paragraphs on the value of food as fuel and of hemoglobin as an oxygen carrier are much more intelligible than they could possibly be otherwise. There are lessons in hearing and on the eye which are, of course, much better understood because of the work in sound and light given in physics.

While the study of digestion is in progress an interesting test of the pupils' ability to employ the scientific method of inquiry is made. Each one is furnished with a piece of cracker and the materials for making food tests. Then he is required to discover

and prove the action of saliva on starch, the only direction given being to allow the bit of cracker to remain a short time in the mouth. Most of the pupils think out all the necessary steps for themselves, alone and unaided. The rest, except the hopelessly stupid ones, are questioned until they see what steps in the proof have been omitted and then they finish the problems.

Some attention is paid to problems in sanitation. Cultures are prepared which show how prevalent bacteria are, what is the difference between tap-water and distilled water, unsterilized and sterilized milk, the importance of methods of dusting and sweeping which prevent the dust from being stirred up, etc. Also at this time they mount and observe with the compound microscope bacteria of decay and the bacteria in the nodules on clover roots.

The remainder of the year is devoted to a little work in zoölogy and much more in botany. The zoölogy is to be introduced this year for the first time, therefore we do not know yet how satisfactory the choice of subjects may be. Certainly there can be made a direct connection between mosquitoes and sanitation and mosquitoes and toads, and surely, the metamorphosis of the frog or the toad, and that of an insect are life-histories which should be common knowledge. The work in botany is correlated with the physiology by experiments which prove that the gas-exchange in respiration of plants is identical with that in animals, and by the study of photosynthesis, whereby they are made conscious of plants as the carbohydrate producers. The rest of the work in botany is to be conducted with a view to rendering the pupil able to tell whether a given plant which he may encounter is a moss or an alga, a fern or a flowering plant, and to start him on his way toward knowing by name, or at least recognizing the family of the flowering plants of his environment.

Of course, if a full year's work could be done, much could be accomplished in the way of applying the principles learned in practical ways. Such work could be planned which might be highly desirable. But in what is virtually a semester's work, no more can be crowded in, and all the theoretical work inserted in the course seems so necessary that we are unwilling to omit any of it for the sake of a few practical applications.

A textbook is used only in connection with the physiology. In the rest of the course the use of one would defeat our aims. We desire that the pupil shall solve the problems himself, shall learn to draw some conclusion from carefully obtained data, and shall gain his knowledge of phenomena by first-hand experience.

There is, it seems to us, no valid reason why this course should not be made a part of the work of the eighth grade, instead of being made to subtract from the time given to science in the high-school course, save that it must be given by teachers of thorough scientific training. Even in the high school where special science teachers are employed, there is great danger that the value of it may be spoiled by teachers who are too thoroughly specialists to enjoy doing such strictly elementary work. Moreover, if the course is to be of equal value with freshman algebra and freshman Latin as a disciplinary subject, the instructor must be one who is quite as much interested in watching a pupil's mind develop habits of scientific thinking as in driving home a few elementary facts. That it may be made of great value as a means of mental training we have not the slightest doubt. That the facts taught here constitute a body of knowledge which ought to be acquired in any common high-school education it would seem that no one could dispute. That some large part of them would not otherwise be acquired by the great majority of the graduates of our high school is a painfully indisputable fact; that many of them are not acquired by the graduates of the average high school in which there is no such course is equally true.

Moreover, to us who are watching the effect of this course upon the school, it is clear that this presentation to the pupils, while they are yet in the early part of their secondary work, of a unified introduction into the fascinating realm of scientific thought and discovery is having a wholesome effect upon their choice of studies, an effect which is helping to increase the size of our classes in advanced sciences despite the apparent lack of value placed upon secondary-school work in science by those bodies of men who determine the entrance requirements of our colleges.

MAKING BOTANY ATTRACTIVE[1]

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The Joliet Township High School, Joliet, Ill.

Some of the ways we have adopted for making botany attractive in the Joliet Township High School are as follows:

The study is approached from what might be called the natural history side. The plants are studied in the laboratory without the use of a text and the questions are such as to require a careful study of the materials for their answers. The "verification method" is carefully avoided.

Considerable freedom is allowed in the laboratory. Pupils are permitted to move about to examine specimens and to discuss their work with other pupils. No requirement is made as to the amount of time a pupil must put upon the subject, other than to insist that he must keep up with the class and must be present at every laboratory period unless he is in advance of the class. Pupils who complete their work in advance are often excused when they have other lessons to prepare or examinations to take.

The better students are encouraged to put in their spare time in the laboratory, whether it happens to be before or after school or during study periods during the day. Such pupils are allowed to select additional subjects for study and if completed according to requirements are given additional credit.

The notebook is written up in the laboratory before any reference work or recitations have been assigned, the object being to have the notebook represent only what the pupil has learned in the laboratory for himself. Numerous drawings, made without reference to a book, are also required.

Examinations come some time after the work in a given subject has been completed and always come at the most unex-

[1] Abstract of a paper read at the Twenty-first Educational Conference of the Academies and High Schools in Relations with the University of Chicago, November, 1908.

pected times, the aim being to discover how much of the work the pupil has retained. In such examinations, all catch questions are avoided and only such information called for as the pupil may reasonably be expected to possess.

Field trips are frequent, even in cold weather. Some trips are simply in quest of material and are made without an outline. Pupils are required to collect their own material and to note its relation to its surroundings and habitat. The trips with outlines are for the study of some phase of botany that cannot well be studied indoors. Two trips to Chicago are made each year, one in winter, to the greenhouses, the other in spring to the Field Museum.

Our pupils maintain a botanical club of more than fifty members, officered by the pupils themselves. To this club no pupil may be admitted who has not completed at least one semester's work in botany with an average of eighty-five. Since membership in the club is a valued distinction, the effect of the club upon work in the classes is excellent. Not only has the number of students taking botany steadily increased for some years, but the proportion of boys is constantly growing, being now about 45 per cent. of the whole number.

THE YEAR'S PROGRESS IN MATHEMATICS IN THE UNIVERSITY HIGH SCHOOL

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The number of capable teachers of secondary mathematics, who are striving to improve the educational quality of secondary-school work is already large and it is rapidly growing. Good secondary teachers are coming to regard it a professional duty to try each year one or more definite things that promise to improve the teaching, to benefit the taught, or to enrich the quality of the subject-matter of their specialty. Attitudes of mind have changed during recent years, and to advocate progress in mathematical teaching has grown half-popular. Enlightened opinion today recognizes—nor fears the academic ban—both the need and practicability of marked improvement in the matter and method of secondary-school mathematics.

The recent awakening of pedagogic interest in mathematics is already accomplishing much in the textbook line. More than a score of secondary texts of the subject, all bearing the imprint of a new order, and some of them from publishing houses that are accustomed to cloaking *commercialism* under the ermine of *conservatism,* and all in a brief twelvemonth, is highly encouraging. The pools of tradition are being stirred to their depths. The official representative of a house that is nothing if not conservative said in substance to the writer the other day: "There are getting to be so many who are wanting the mixed type of mathematics in the high school, that we had to get a book written to cater to this audience." The easy-going unconcern for innovation that afflicted teachers of mathematics only a brief time since now appears in print only rarely and in places so out-of-the-way as to work little harm.

And what has been achieved is but an earnest of greater and better things in the next decade. Traditional rigidity, institu-

tional conservatism and pedantic dread of change are ceasing to be obstacles. Modern life and its needs, the modern boy and his needs, are year by year being less frowned upon in the schoolroom. The self-constituted flag-men along the route of progress are less hysterical and more sane in signaling the dangers of rapid change in school mathematics. Many of them are even getting on board. In numerous ways professional life to progressive teachers of mathematics is becoming more and more worth while. For all these blessings let us be duly grateful!

The High School of The University of Chicago lays no claim to exclusive consideration as an experimental laboratory for dealing with practical problems of secondary mathematical education. It does, however, claim to be such an institution as this and it is doubtful whether any such laboratory enjoys freer and more favorable conditions for its legitimate work of experimentation than exist here. One of the ambitions common to its teachers and administrative officers is that this peculiarly favorable environment shall redound in the fullest possible measure and in the largest way to the most substantial good of the public secondary education of the nation. The determination of those responsible for the mathematical instruction is to leave no part of their peculiar duty undone that may serve to promote the gratification of the common ambition to aid every legitimate advance. Under such circumstances avowals of faith, and citations of progress made from time to time on the part of the mathematical corps cannot fail to attract some professional interest.

The mathematical corps of the University High School keeps two distinct purposes before it, viz.: (1) By the aid of its peculiarly favorable equipment to work out practically and to organize into generally practicable texts the best possible type of subject-matter for secondary students of mathematics; (2) To make its classrooms function both as laboratories and as exhibit rooms for the study of the best possible type of secondary teaching both for actual and for intending teachers of secondary mathematics.

In its attempt to meet this double purpose the efforts of the

mathematical corps are ever concentrated upon what is *practical* and *practicable* under conditions prevailing in the public secondary schools in general. From certain remarks pertaining to some statements the writer made in an article in the issue of the *Review* for October, 1907, it would seem that some look upon the purposes and problems of the University High School as having only a narrowly specialized interest. Let it therefore be stated plainly that the mathematical corps is seeking nothing more narrow than the best type of mathematical education for the public secondary schools of our country. There is no special feature in our situation to restrict in any way the significance of our findings. The students of the High School come mainly from the public schools; from the most varied class of homes; they represent the most widely varied conditions of society, and are of a highly cosmopolitan character. Many are preparing for college and many more are preparing for non-collegiate pursuits. The purpose of the school is to give its students the best type of education for the period of life from fourteen to eighteen years of age.

Perhaps the only restrictive element in our situation that is peculiar is that a larger percentage of our students than is common in high schools generally are preparing definitely for colleges. But this is the limitation of high-school autonomy about which high-school men complain most loudly, and if it rests more heavily upon us than upon others, our educational findings ought to have even greater practicability and workability elsewhere than here. We do not feel, however, that this circumstance is so objectionable as many hold it to be. All this is but another reason why what is achieved here should be of general interest.

In the report made in the *School Review* in October, 1907, under the title, "The Year's Progress," it was stated that the first three or four weeks at the beginning of the first year would be set aside hereafter for the explicit purpose of reviewing the arithmetic topics in which beginners are always found deficient. In addition to this review, an attempt was to be made to accomplish something of a scientific filling out of the topics of arith-

metic with a view to bringing them under better working control.

After a year's experience in this matter it seems much better to accomplish this review under the guise of algebra. Beginners hold themselves somewhat in abeyance at the thought of going over again what they have grown tired of. They feel that they have done their arithmetic work satisfactorily, to their former teachers at least, and that to call upon them to go over this work again is to discredit the preparation upon which they have been admitted to the class. This feeling prejudices appreciably the point of view of the beginner toward his high-school work. It seems better to escape it by a type of algebraic work which, while perhaps it looks like advanced work, and in a sense is advanced work, is at the same time a *re*-view of the arithmetic. This makes the beginning work, which is difficult enough at best, much smoother, more palatable, and, on the whole, more encouraging at the outset than does a frank going over of the grade-work in arithmetic. Accordingly, exercises for testing and reviewing the addition and multiplication facts of arithmetic are given in the form of equations for mental treatment to find x, like the following:

$$2x+x=\ 9$$
$$7x+6=\ 62$$
$$8x-4=\ 52$$
$$11x-2x+3x=108, \text{ etc.}$$

For review of the laws of arithmetical calculation are given numerous oral exercises to find the value of the letter, such as these:

$$4x-3=12\ ;$$
$$16t+2t-13t=22\tfrac{1}{2}\ ;$$
$$6s-3\cdot 5s+5\cdot 5s=68\ ;$$
$$\frac{x}{2}+\frac{x}{4}=3\ ;$$
$$\frac{t}{3}-\frac{t}{6}=10\ ;$$
$$\frac{15}{a}=5\ ;\ \text{etc.}$$

Such exercises are given continually and systematically for several days, until the arithmetical processes are well mastered.

Incidentally, the use and office of the equation is being *sensed.*

It was also stated in the report of progress of October, 1907, that the plan of paralleling the geometry of the second year with a course in algebra was unsatisfactory, (1) because of the pupils' dislike for the plan of being led from one subject to the other at what seemed to them the whim of the teacher; (2) because the teachers themselves felt that they could not make their case with the pupils clear enough to justify this abrupt change, and (3) because American textbooks are poorly planned for parallel work. On the whole, under the circumstances then existing, the results of the year's attempt to carry on parallel courses in algebra and geometry in the second year were reported not favorable to the plan.

From the remarks that have come to him concerning the report, the writer feels that he overstated the case to the disadvantage of the parallel plan. Not one of the teachers who tried the plan felt that the trial was a fair one. This was conceded freely and immediately by everyone who tried the plan. For the reason that the plan was imperfectly worked out beforehand, and because of the general difficulties of presenting the work to advantage with the materials and texts that had to be used, more time was felt by all to be necessary before a satisfactory, and anything like a final judgment could be formed.

Pupils of the second year are still little more than children. They are highly dependent in their modes of thinking upon teacher, book, and external help. The parallel plan under existing conditions, to be successful, requires at least a modicum of independence and maturity. It has been determined therefore to test the parallel plan more fully and more fairly by applying it this year in the third-year classes of the University High School. We are, therefore, giving the class time of this year in about equal portions to trigonometry and advanced algebra. The teachers are reporting results to be highly satisactory. They feel that because the students here are more independent in their thinking, because they are already in possession of the outlines of the sciences of algebra and geometry, and perhaps because the teachers themselves, who have now had considerable experience

in ways of putting into correlation the facts of algebra and geometry, are more skilful than they were two years ago, and because of the innate virtues of the plan of keeping the twofold point of view always present, the parallel plan promises a high degree of success in the third-year work.

Encouraged by this promised success in the third year, our teachers are rapidly coming to feel that the reasons for dissatisfaction in the second year, as the plan was attempted, may be easily obviated. The two lines of work must be more closely associated and interconnections should be more definitely and more strongly made for the second-year pupils. By giving more attention to the subject-matter with reference to accomplishing these ends, the parallel plan, with numerous interconnecting passages back and forth between the two fields of algebra and geometry, will much improve results in the second year. A body of subject-matter is already begun by the high-school teachers with the purpose of facilitating the parallel plan here. With even measurably suitable texts the parallel plan will assuredly succeed admirably also in the second year.

The first year's work has been based essentially upon the little book, *First-Year Mathematics* (The University of Chicago Press), but many supplementary developments and adjustments which deviate from the little book of notes have improved things materially. The revision of the notes—for the book was little more than a body of notes—into what will be a *Textbook of First-Year Mathematics,* is now far along and is working admirably in the High School classes.

It may be well to specify a few of the alterations that experience has shown to be desirable. The fundamental thought is that in the first year's work the high-school pupil shall face his problems as mathematical problems, rather than as algebraic or geometric problems as such. The specialized point of view is too highly sophisticated for beginners. It is clear to all that much more geometry, both as to form and subject-matter, is needed in the first year, and the text which is to appear soon from the University Press will emphasize the geometric point of view and mode of attack much more fully than does the little

book now in use. The body of mathematical material making up the work of the first year is something more than mere mixed mathematics. In numerous ways the material has been correlated into a more unified than merely a mixed body of truth, though even a mixed type of subject-matter keeps the twofold point of view of both algebra and geometry continually in mind.

It seems clear that the geometric mode of procedure impresses the beginner more deeply than does the algebraic. Reasons seem to rest more firmly upon substantial bases of concepts in geometric work than in the customary isolated type of algebraic work. The pupil readily carries the faith in the soundness and reasonableness of mathematical processes gained in geometric work into the algebraic domain. He comes to feel that whether he sees the *rationale* of the process of algebraic treatment or not, there *is* a *rationale*, and that he ought to get hold of it. His attitude toward his work has in it at least a tinge of morality. He cares more to understand the algebra. He confronts the algebraic work—which is made the organizing line of ideas through the first year—more seriously, more interestedly, and more profitably than he does by devoting exclusive attention to wholly algebraic beginnings.

Another improvement, which the study of high-school work has shown to be desirable in the interest of education, is making itself felt for good in the high school. Few high-school teachers have failed to feel that it is distinctly unwise to condense all the mathematical work of the high school into the first two years, as is customary, and to allow mathematical interests, as such, to be taken care of for the next two years, either not at all, or indirectly through certain subjects calling here and there, in a random way, for the application of a little mathematics. The last two years of high school lie as a long gap between the mathematical work which the pupil has at best but poorly mastered during the first two years—the crudest period of the high school—and the time when he must face the severe tests put upon him by college-entrance examinations, or by the demands of industrial and commercial life. In short, as the work is customarily programmed, the two most immature years of

the high school are given to this most highly matured branch of study of the whole curriculum. Then come two years of doing little or nothing in mathematics, and then come the tests. It is little wonder that the high-school pupil often disappoints his high-school teacher and administrative officers by the way he fails to meet the tests that are put upon his work. The wonder is rather that he meets them as well as he does.

As a step in the right direction of removing this difficulty, this year but four hours a week are being given to mathematics in the first year, and every student of the fourth year is being required to take one hour per week of work that will call up and renew his former hold on mathematics, and perhaps strengthen it a little. It is thought this plan may aid the high-school graduate to know what he knows when he needs it.

The method of procedure followed in working out the foregoing plans in the classroom is now and has been to develop the outlines of the theory of the several subjects with—not for—the class, and to assign supplementary work for the study-hour or for home-study that is of the nature of fuller developments of the theory, or of applications of the theory, or of exercises to deepen and to impress this theory. If by laboratory plan, work of an individual character in the classroom under the supervision of an expert may be understood, then we may successfully claim to be making considerable use of it. But with this plan as with all devices for accomplishing the ends of mathematical education, we use it but do not permit it to dominate instruction. When a little lecturing, or a little free-and-easy chatting over difficulties, or a little exhibiting or exemplifying of the way to resolve difficulties seems to be the most economical procedure, no teacher hesitates to resort to it. The heuristic method, the laboratory method, the socratic method, the inductive method, the deductive method, and numerous others are in the best of repute with us, but, of course, they are regarded as mere tools to be used as occasion shows them to be economical or otherwise desirable. No one method, nor even many of them taken together, are looked upon as of sufficient educational value to warrant their exclusive jurisdiction over the work of instruction.

We insist upon the open-door policy as to mathematical method. One teacher reports that the greatest benefit he has derived during the year is the firmness with which he has become convinced that extensive use of the inductive plan is best for beginners in secondary mathematics. Another feels that it is his most important finding that a combination of the inductive and deductive methods is best, as the transition from induction to deduction, which must be made, can best be effected by laying hold freely of whatever type of treatment seems most perspicuous to the learner with the particular subject under consideration. Another finds that the nature of the subject, or problem, largely determines its method.

In addition to the effects on the curriculum, the effects in the way of a better attitude on the part of the pupils toward the study of mathematics have been highly gratifying. Most of the early criticisms that pupils made to the unified, or mixed type of mathematics were intended as mere compliments to the views they knew to be held by the grown-ups, to whom the criticisms were made. In the writer's opinion, and his view is shared by many others, the mathematical spirit among the students is more friendly and more positive now than it has been for years. May the nature of the subject-matter not claim a little credit for this happy state of affairs?

But I must not omit to specify the effect which the past year's work has had upon the teachers themselves. It seems best to allow these teachers to speak each in his own way. The writer has requested each one to specify as he chooses what the year has wrought for him. The reader of this report may, therefore, judge for himself as to whether or not the more spirited work of teachers who are holding themselves in the experimental frame of mind is worth while. Many have remarked that in the public schools experiments cannot be attempted because time is too expensive for experiments, which might perhaps lead to negative results. I am sure this view is unwarranted and will yet be seen to be so by public-school men. The spirit, the alertness, the *verve* begotten by a half-dozen—or by even two—capable teachers working in concert, perhaps with a touch of the

spirit of rivalry, will produce results so rich and so copious in character, that the time lost in experiments which issue now and then negatively will be many times atoned for, both in the quality and in the quantity of the results. The number of pedagogical experiments that issue in a negative outcome may be reduced almost to the vanishing point by carefully maturing them beforehand. It seems to be the blessing of practical pedagogics that an experimenter who believes in a plan and tries to make it work will certainly succeed. Ninety points of success out of a hundred are faith, works, and will. The experiment may prove to be a success only with the individual teacher, but this safeguards the interests of the pupils upon whom the experiment is tried.

I give below, without signatures, and without comment, the responses made by the University High School teachers to the request that they state what the year has done for them as teachers of secondary mathematics:

One high-school teacher writes:

> Some experimenting has been done in the teaching of plane geometry the past year with the object of starting the course more satisfactorily than with the sequence of definitions and propositions of standard texts. The difficulty which most students have in beginning formal geometry has led many experienced teachers to believe that the usual course should be introduced by a more or less extended course in constructive and experimental geometry. Some English texts are written on this plan, but in America the standard texts attempt a strictly logical order and treatment from the beginning. The books on experimental geometry that we have are designed primarily for the last years of the elementary school, and are either too elementary for the second year of secondary schools, or they require more time, if used as a prologue to the regular course, than can be spared for them as curricula now stand.
>
> Furthermore, to divide the course in geometry into a first part, which is wholly experimental, and a second part which is wholly theoretical, is doubtful procedure. The opinion is growing that a more satisfactory plan is to start with constructive and experimental work, with the early introduction of some easy demonstrations of a purely theoretical character, using the experimental method in some cases as the best means, for the time, of establishing a theorem, in other cases as an approach to a theorem proved at once theoretically. Moreover, many portions of the kind of experimental geometry needed to preclude formal geometry are so easy and they adapt

themselves so readily to algebraic work based on it, that much of this work should be done in connection with the first-year work in algebra. This experimental geometry in the first year answers the purpose of an introduction to second-year geometry, and serves to enrich the first-year course in mathematics.

A double distribution of this sort between the first and second years of this preliminary, concept-forming work in geometry is a part of the plan now under way at the University High School. While the material is being prepared for this reorganization of the courses in algebra and geometry, the effort has also been made to inject into the usual course in plane geometry, with a standard text in the hands of the class, considerable experimental geometry as well as many algebraic problems based on geometrical theorems. The following plan, a part of which was tried with satisfactory results by the writer, is offered as a suggestion of how this may be carried out without doing violence to the unity of the course as found in the ordinary textbook. The numbers refer to the sections in Sanders' Plane Geometry:

I. Theorems assumed: 40, 41, 49, 92, 108, 111, 177, 181, 182, 189.
II. Theorems treated experimentally only: 30, 35, 60, 73, 115, 121, 123, 127, 128.
III. Theorems treated both experimentally and theoretically: 47, 53, 55, 77, 81, 85, 89, 94, 100, 138, 157, 164, 192.

The experimental treatment appropriate to the theorems in II and III, above, is such as is found in Baker, *Elementary Plane Geometry;* Smith, *School Geometry;* Warren, *Experimental and Theoretical Geometry;* Wentworth and Hill, *First Steps in Geometry;* or Campbell, *Observational Geometry.*

In two geometry classes the course was started with the algebraic problems based on geometric material, which are found in *Geometric Exercises for Algebraic Solution* (Chicago: The University Press). By this means considerable first-year algebra was reviewed while the geometric notions and facts were being introduced. It would be easy and profitable to carry this initial work in *Geometric Exercises* through the first twenty-three pages, introducing experimental proofs for the theorems on which the algebraic problems are based.

As a further step toward bringing the algebra and geometry together the problems in *Geometric Exercises* were used throughout the year in all geometry classes with satisfactory results.

The past year's experience in first-year classes has shown that experimental geometry in the first year is desirable from the point of view of first-year algebra as well as from that of second-year geometry. The geometry adds concreteness and variety to the first-year course, and arouses the interest of students, methods of presentation being partly experimental and partly theoretical. Experience in teaching the small amount of geometrical matter at present provided for in *First-Year Mathematics* has

convinced the instructors that it is not only practicable but highly desirable to put more in the first year. In some of the classes it was found profitable to use, in addition to the geometrical matter of the text, "algebra-geometry" problems from the first twenty-three pages of *Geometric Exercises,* the instructor presenting experimental evidence for the truth of theorems needed. In the revision of *First-Year Mathematics* it is accordingly planned to add considerable geometrical work, connecting with it numerous algebraic problems based on the geometry.

An argument in favor of a course in geometry for secondary schools in which the theoretical method is introduced, and to some extent accompanied, by the experimental method, is that it has regard for the natural order of procedure of the learning mind. The geometry which has been and is now taught in the secondary schools of this country represents the mature thought of the ancient Greek mathematicians who philosophized on the properties of space. But we are not warranted in assuming that the youth of fifteen or sixteen years of age has the interest or point of view of the mature philosopher, just because he begins the study of geometry on a certain day. Quite a different view is more nearly correct. It would be better to assume that just as the mature reflection of the Greek mathematicians was preceded by the empirical thinking of the Egyptians and Babylonians, so the modern young student, and for even stronger reasons, should begin the study of geometry in an experimental and intuitive way, developing gradually his powers of logical reasoning.

To use both the experimental and theoretical methods in the teaching of geometry, and to distribute the subject-matter of algebra and geometry, with their applications, throughout the first and second years, so as to meet most naturally the needs of the student's growing powers and his interests, is a part of what is being attempted by the department of mathematics of the University High School in its function as an experimental laboratory of the School of Education. The experiments of the past year which are here described have shown that such a reorganization of subject-matter can be made with profit, and that the change from the old to the new can be made without doing violence to the existing order of things.

Another says:

THE WORK OF THE FIRST YEAR

The first four weeks of the first year were devoted to a review of the most fundamental topics of arithmetic. An outline, prepared by a committee of the mathematical department of the High School, was made the basis of the work. After this review, tests in arithmetic were given to all high-school students taking first-year mathematics, and from those who failed an afternoon class in arithmetic was formed. At the same time all were allowed to remain in their regular classes. No homework was required for the special review class, all the work being done under the

supervision of the instructor, assisted by several practice teachers. Students appreciated greatly the opportunity to review a subject in which they knew that they were deficient and several students who *passed* in the test, asked permission to enter this special class and were admitted.

It was found that all of the students of the class were able to do the work, that they improved in the regular classwork and that most of them passed at the end of the quarter. Similar classes are to be formed in the future.

One thing a good teacher must keep in mind is, that he must make the study of mathematics seem interesting and useful to as many of his pupils as possible. He cannot afford to be satisfied with the interest of the few to whom the subject itself may appeal. By bringing in many practical illustrations and by reducing the amount of memory work, I have been more successful this year than in previous years in getting a large number of students interested. It seems that one reason why so many students in upper classes appear to have forgotten so much of the preparatory work is that they memorized rules without having a clear insight into the meaning of them. The following will illustrate: A student in an upper class has difficulty in deciding whether $-2+(-3)$ is equal to -5 or $+5$. He dimly remembers a rule "Like signs give plus, unlike signs give minus," but the purport and propriety of the rule are not clear to him. If, instead of merely learning the rule in the first year, he had been taught to think out the result by means of a practical illustration, as: A loss of two dollars followed by a loss of three dollars is a loss of five dollars, until he could get his results just as quickly and easily as if he were working with a rule, he would be in less danger of becoming confused in deciding for himself whether -2 plus -3 is equal to -5 or to $+5$. Less emphasis should be placed upon the rules, but more upon thinking out the underlying reason. This plan seems to me to bring better results and to make the work less formal and much more enjoyable to the pupils.

The textbook, *First-Year Mathematics*, with all its weaknesses, proved to be a great help. It relates the subject-matter to other sources of education and to matters of everyday life, thus arousing an interest which otherwise would be difficult to obtain. New topics are approached inductively and concretely. By emphasizing matters of conception, something is left to the imagination and relief is brought to the mind. Thus the student does stronger work than he could if concrete illustration were not given.

The symbolic expression for a law is usually made about the last step in the treatment of a subject. It grows out of the verbal statement, and the symbols are suggested largely by the students themselves, as a means of getting the statement of a law that is quickly understood, and easily referred to for subsequent needs.

By changing the order of many topics, some of the objections against the test were removed.

THE WORK OF THE SECOND YEAR

The work of the second year was introduced by a view of the practical side of the subject of geometry. The aim of the course was made clear. A knowledge of many geometrical concepts was obtained from the study of solids, known to the students, as the cube, the tetraedron, the cone, the cylinder, the prism, and so forth. Many related or suggested theorems of plane geometry were taught and, both by repeated application and by means of problems leading to algebraic solutions, the pupil learned practically all the theorems of the first book of Euclid. Other theorems were developed by constructing figures and by measuring relations between angles or lines with protractor and ruler. These theorems were then used in solving the problems of the first twenty-five pages in *Geometric Exercises for Algebraic Solution.*

The work of getting the equations and deducing other results from them gradually assumed a demonstrative character, and then the study of the demonstrative proofs was taken up. The study of algebra was kept up throughout the year by solving geometric problems algebraically.

The plan, as outlined above, makes the transition from the first year to the second easy and natural. The student knows from the beginning that algebra and geometry are not to be separated, and that he will be held responsible for what he has learned in both subjects. He must be active from the first day on. He produces, he invents new truths, and what he gets is his own and stays with him. This gives him a feeling of enjoyment, which is hard to obtain by dragging him through a number of theorems, where he is always forced to admit, to repeat, to memorize.

Many students to whom the subject of geometry does not appeal, will become interested when it is presented both from the geometric and algebraic point of view.

Teachers who visited this class frequently asked whether I expected to cover all the work given in the geometry text, besides doing so much of the algebraic work. I think that this class did at least as much geometry as any of my classes in preceding years. Most of the original exercises in Sanders' text and also all problems in the first half of and many of the last part of *Geometric Exercises* have been worked by pupils and explained in the classroom.

One of the features of this class was, that original work was done by some students and results were given to the class; and that lectures and talks on topics which involve good geometry, though not given in the ordinary texts, were given by the instructor and outsiders, who were invited to speak. Such talks arouse much interest and develop an attitude towards geometry such as a pupil has toward a good story, which he wishes to remember for the purpose of telling it again. When this attitude is obtained, much overexplaining and mechanical review work can be omitted.

The work of the second year in the next school year will differ in some respects from that of the past year, as many new suggestions have come up, which could not be tried this time.

THE WORK OF THE FOURTH YEAR. SOLID GEOMETRY

The aim of the course was made clear at the beginning. Models of all solids to be studied were examined and a way worked out by which the areas and volumes may be obtained. Many of these results, e. g., the lateral area of a prism, were found before taking up the first book in solid geometry. The propositions of this book were proved when they were needed. As soon as a new formula was derived, it was applied to some solid.

One of the features of the course was the construction of solids by the students. Diedral angles, triedral angles, opposite and symmetrical triedral angles, polyedral angles, and so forth, were made of paper or string and used in the recitation together with the picture drawn on the blackboard.

Before drawing on the board figures containing relations of lines and planes in space, models of these figures were made by means of a few sticks and some cardboards. In the beginning every proposition was pictured this way.

The plan of letting the development of solid geometry proceed from the needs of mensuration of solids, and of treating the customary propositions as need for them arises in discovering ways of finding surface areas and volumes of the standard figures, begets a lively interest and will be followed more fully in future classes.

COLLEGE ALGEBRA

The subject was gathered around two topics: (1) the solution of the equation; (2) the series. By uniting the different topics of college algebra in this manner, much time was saved and, although the class was not strong, more ground was covered than in previous years. A great deal of graphical work was done to interpret the meaning of algebraic results and to assist in the solution of equations. This plan of unifying the subjects of college algebra is commended to teachers of high-school classes.

A third writes:

The new education lies along the paths of manual training and laboratory methods. The hand leads, the perceptive and reasoning faculties follow. The concrete comes before the abstract.

In trying to realize these ideals in teaching geometry in the University High School I have proceeded as follows: Compasses, straight-edge, and paper, unruled, cross-ruled, and for tracing, are in the hands of each pupil at every recitation. In the classroom the pupil is introduced to the geometrical magnitudes, the surface, the line, and the point, by being required to crease paper for the purpose of showing *surface*, and *line* as the inter-

section of surfaces; to draw or crease two intersecting lines, for the purpose of showing and locating *point;* to draw many lines through *one* point; to try to draw more than one straight line through two given points.

The *doing* of these and similar things prepares the pupil to understand the introductory definitions, postulates, and axioms.

In preparation for demonstration of theorems, the figures are drawn by each pupil in class according to the hypothesis (protractors being used at first); then tracing paper is used to show congruency.

The tracing paper, where possible, is made to serve in realizing a truth and comprehending a demonstration. For example: before proving the first proposition in our text, viz., the congruency of triangles having an angle and the including sides respectively equal, the pupils are asked to draw a triangle, then on tracing paper to trace two sides exactly as they lie. The *completion* of the triangle consists in connecting the points that are the ends of the two sides traced, and they *see* that this third side also *must* coincide with the third side of the original triangle.

The pupil is taught early in the course to use the straight-edge and compasses to bisect line and angle, to draw a perpendicular to a line through any given point, and to construct an angle equal to a given angle. When drawing figures in class, either on paper or on the blackboard, the construction with instruments is insisted on, and the principles on which it is based are frequently asked for.

To realize the truth of the theorems on proportionality of sides and the facts about areas, the diagrams are constructed by the pupil on cross-ruled paper, and the units are counted. When the class starts with the same length of line, considerable interest is aroused by a comparison of results.

New propositions are developed by the instructor with the pupils before assignment for study, especially with a view to drawing out from the pupils the starting-points and possible methods of reaching conclusions.

An important element of our geometry work is the assignment of *algebraic problems* based on the propositions demonstrated. The mathematical faculty of the school have all contributed to a book of problems in an effort to secure a series of problems to illustrate all the important theorems. About one-fifth of the time is devoted to this algebraic work. In this way the *meaning* of the *facts* stated in the theorems is made clear, and by repeated use in solving problems the facts are fixed in the memory. Besides, the continuity of algebra from the first year is secured, and the ability to *use* algebra as a tool in other sciences is developed.

Sometimes the whole lesson is given up to the algebraic problems, but usually the algebra and the geometry are portions of the same lesson. From these statements it may be seen that the aim of the instructor is to make *handwork* precede the proposition, and to make it contribute constantly to clear thinking in the abstractions of geometry. The difficulties

lie chiefly in the neglect of pupils to bring to class the materials and instruments needed for the day.

In first-year algebra my experiment has been to develop the value of *testing,* or *checking every process* and *problem.*

The first result to the pupil noted, is that he sees that he is dealing with actual numbers because in the fundamental processes with literal integers and fractions as he substitutes an assumed numerical value for each letter in the general numbers given, and in his result, he *sees* that they represent the same *number.*

Another result is that the pupil obtains a clearer *notion* of the fundamental *processes.* For example, if the problem is to subtract $a^2-2ab+b^2$, from $a^2+2ab+b^2$, he obtains $4ab$, this *means* that $4ab$ is the number which he must *add* to $a^2-2ab+b^2$ to produce $a^2+2ab+b^2$. This *adding* of the remainder to the subtrahend is also done after substituting some assumed definite number for each letter of the general numbers. In a problem in division such as $a^3-8b^3 \div a-2b$, he is required to multiply his result into $a-2b$ to see whether it produces a^3-8b^3. By repeatedly performing the multiplications, the fact is impressed on his mind that the quotient is the *number* by which the divisor is to be *multiplied* to produce the dividend, and thus seeing *what* he is to find he is less likely to make a blunder in the process of finding it.

In division of fractions this same fact appears again, and considerable interest has been awakened in seeing the fractional dividend appear out of the complicated forms of the combined divisor and quotient.

Again, the *algebraic notation,* the difference between coefficient and exponent—between $3x$ and x^3 and other forms is fixed by repeated substitutions of arithmetic numbers for the letters in testing each result. The algebraic language is thus more rapidly learned and understood.

Again, the meaning of the *solution* of an *equation* or system of equations is made clear in literal equations, for by testing his results he *sees* that his "value of the unknown" put in the place of the unknown letter makes both sides of the equation absolutely the same, e. g., solving for x the equation $\frac{mx}{n}+\frac{nx}{m}=m^2+n^2$, he obtains as a result $x=mn$, substituting to test this result, he gets $\frac{m^2n}{n}+\frac{mn^2}{m}=m^2+n^2$. Reducing the first member he gets $m^2+n^2=m^2+n^2$, plainly an identity. To test the result in the same problem by substituting arithmetic values, let $m=2$ and $n=3$: then as $x=mn$, $x=6$: Substituting these values in the original equation $\frac{2\times 6}{3}+\frac{3\times 6}{2}=4+9$. By reducing the fractional forms we get $4+9=4+9$. Thus the pupil *sees* that the solution of the equation means that giving x the value mn produces a *visible* equality or identity, that the sides of the equation are not only *said* to be equal, but that they are plainly seen by him *to be equal numbers.*

The lively interest shown by first-year pupils in this *constant* testing of results, has been a pleasant *surprise* to me, although I have taught first-year algebra for many years. In the study of *factoring*, the plan of testing *every* result by one or two methods was adhered to in this year's experiment. The pupil, in example after example, *multiplies* his "factors" together to see whether the product is the original number, using either the exact general form of his factors or the arithmetic form obtained by assuming and substituting values, or both ways, so that he knows what is *meant* by the "factors of a number."

Moreover he is not uncertain regarding the correctness of his work nor is he so likely to leave his factoring in bad shape so common with beginners such as the factors of $ax+bx+ay+by$ are $x(a+b)+y(a+b)$; and + and — signs are less often out of place in factoring a^3+b^3, and a^3-b^3, etc.

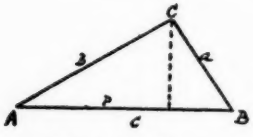
In the solution of verbal problems by use of the equation the value of the test is of course evident. The objection to this plan of testing every example is that fewer problems can be done in a given time, but my experience leads me to say that my first-year classes, after using this method, surpass in rapidity and accuracy of work all former classes, and their pleasure in the work is far greater.

A fourth writes on methods in plane trigonometry which have been found to be very satisfactory.

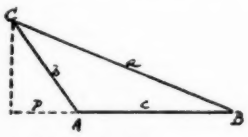
After a thorough understanding of the functions of an acute angle and the solution of the right-triangle, take up the functions of an obtuse angle including the quadrantal angle 90°. Next, derive the formulas for the solution of the obtuse-angled triangle by methods of plane geometry as follows:

I. *Derivation of the sine law by methods of plane geometry.*—This is given in all texts.

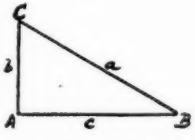
II. *Derivation of the cosine law by methods of plane geometry.*



$a^2=b^2+c^2-2Pc$
$p=b\cos A$
$\therefore a^2=b^2+c^2-2bc\cos A.$



$a^2=b^2+c^2+2Pc$
$p=-b\cos A$
$a^2=b^2+c^2-2bc\cos A.$



If A is 90° the formulas become
$a^2=b^2+c^2$ (?)

III. *Derivation of tangent law by methods of plane geometry.*

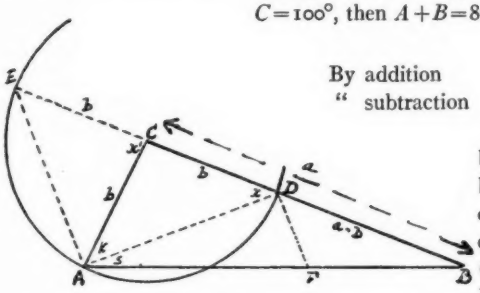
$\frac{\tan\frac{1}{2}(A-B)}{\tan\frac{1}{2}(A+B)}=\frac{a-b}{a+b}$ or $\tan\frac{1}{2}(A-B)=\frac{a-b}{a+b}\cot\frac{1}{2}c$. To solve a $\triangle$ when

two sides and the included ∠ are given, $(a, c, b,)$ find first by the above form $\frac{1}{2}(A-B)$. Suppose $\frac{1}{2}(A-B)=10°$, and $C=100°$, then $A+B=80°$, $\frac{1}{2}(A+B)=40°$

$\frac{1}{2}(A-B)=10°$

By addition $A=50°$

" subtraction $B=30°$



The $\triangle ABC$ can *now* be completely solved by aid of sine law constructions. C is the center of arc EAD, CE=CD=*CA* and DEA=a rt ∠ (?) DF is drawn || EA ∴ ◬ DFB and EAB are similar $X'=X+K=2X$ (?) $\therefore X=\frac{1}{2}X', X'=A+B. \therefore X=\frac{1}{2}(A+B); s=x-B=\frac{1}{2}(A+B)-B=\frac{1}{2}(A-B)$(?) EAD and ADF are rt ◬ (DF || EA)

$$\frac{\tan\frac{1}{2}(A-B)}{\tan\frac{1}{2}(A+B)}=\frac{\tan s}{\tan x}=\frac{\frac{DF}{DA}}{\frac{EA}{DA}}=\frac{DF}{EA}=\frac{DB}{EB}=\frac{a-b}{a+b}.$$

$[\frac{1}{2}A+\frac{1}{2}B+\frac{1}{2}C=90° \therefore \tan\frac{1}{2}(A+B)=\cot\frac{1}{2}C]$.

Hence $\tan\frac{1}{2}(A-B)=\frac{a-b}{a+b}\cot\frac{1}{2}C$ [sim. $\tan\frac{1}{2}(B-C)=\frac{b-c}{b+c}\cot\frac{1}{2}A$, $\tan\frac{1}{2}(C-A)=\frac{c-a}{c+a}\cot\frac{1}{2}B$].

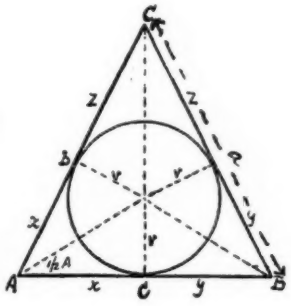
IV. *Derivation of the formula* $\tan\frac{1}{2}A=\frac{r}{s-a}$ *by methods of Pl. Geometry.*

$[s=\frac{1}{2}(a+b+c)]$

$[s=\frac{1}{2}$ the perimeter$]$

To prove:

$$\frac{\tan\frac{1}{2}A=\frac{r}{s-a}}{\tan\frac{1}{2}A=\frac{r}{x}} \text{ and } r=\sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$$



$2x+2y+2z=2s$

$\therefore x+y+z=s \therefore x=s-(y+z)=s-a$ i. e. $x=s-a$.

Area of $\triangle=F=\frac{1}{2}ar+\frac{1}{2}br+\frac{1}{2}cr=\frac{1}{2}(a+b+c)r=sr$

$$F=\sqrt{s(s-a)(s-b)(s-c)} \quad \text{(by Pl. Geom.)}=sr.$$

$$\therefore r=\sqrt{\frac{s(s-a)(s-b)(s-c)}{s^2}}=\sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$$

Hence $\tan \frac{1}{2}A=\frac{r}{s-a}$, $\tan \frac{1}{2}B=\frac{r}{s-b}$, $\tan \frac{1}{2}C=\frac{r}{s-c}$ where $r=11$

The above proofs are easily worked by the class and the solution of the oblique triangle "takes hold" at once. Insistence on the graphic method in connection with the above adds to the interest and understanding in no small degree. I might add other methods of presenting other parts of the subject than the orthodox, formal, cut-and-dried ones of the ordinary text, but none has the importance and helpfulness of the above.

A fifth writes:

From persistent practice during my teaching of the past year, I have become thoroughly convinced that the inductive treatment of subject-matter in mathematics is the proper method. By the inductive method I mean the process of leading up to every general statement by the easiest and most gradual concrete examples, allowing the pupil himself to develop the habit of making generalizations. It is remarkable and unfortunate how universal is the procedure in texts and in teaching of stating the general truth usually in very abstract language followed by one or two illustrations. Moreover many texts make the error of attempting to make principles and theorems too general rather than merely sufficiently general for the case in hand. This frequently has the effect of making the principles incomprehensible to the pupil.

HIGH-SCHOOL DRAMATICS

ALLAN ABBOTT
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The desire of the boy or girl to act is the normal outgrowth of the play instinct of childhood. And just as the kindergarten games develop social instincts, group-sympathy, and imagination, by taking the child out of his merely private interests, so in the adolescent period the acting of plays—the assuming of another person's clothes, manners, ideas, ambitions—is bound to widen and develop the personality of the young actor. This point has been very fully and interestingly treated in a recent *Atlantic,* in an account of the Children's Educational Theater, in New York.[1] I have often seen a boy, under the influence of dramatics, so come out of his shell and reveal unsuspected traits of character—self-confidence, command, resourcefulness, energy, unselfishness, responsibility,—that not only his teachers but his classmates as well have declared that the play was the making of him. In fact I do not hesitate to say that this one element of character development is worth all the time and effort that dramatics cost.

A less important point, but one still worthy consideration, is the drill in elocution secured not only by the chosen actors, but by all candidates for a part. The old-time "declamation" is nowadays somewhat discredited, and its place is in few schools filled by anything that stimulates clear and effective vocal expression. Drill for a play is elocution in the best sense; demanding the greatest clearness and range of voice, yet free from the hollow pretentiousness of declamation, because the speaker really has ideas to communicate to an audience who really want to hear.

Dramatics may be made to serve the further purpose of

[1] G. Minnie Herts, "The Children's Educational Theater," *Atlantic Monthly,* December, 1907.

acquainting pupils with good literature. Many classical plays are entirely suitable for amateur production; and some modern ones are not without literary value. There is all the difference in the world between the study of a play in the classroom and the vivid realization requisite to its production on the stage. The actors, however crude their production, must see the play no longer as a school task, but as something full of life and meaning.

A great social benefit from a properly managed play is its effect on the general spirit of the school. It is comparable to a football game, with the added advantage that it brings into prominence students of other than physical prowess. As in football the secret of success is team play, even more so in dramatics; success demands not only the subordination of the individual to the total effect, but also involves the co-operation of managers, stage hands, electrician, prompter, ticket agents, ushers, designers of posters, and others. It is possible, and wise, to use as many as fifty or seventy-five pupils in the management, and so make the play a means of solidifying the entire student body.

Objections, however, are often raised to dramatics, on the following grounds:

First, they take a very great amount of time, and so lower the standard of scholarship. This loss is said to affect the pupils who can least afford it—the seniors, already burdened with college preparation. Unlike athletics (which are open to the same objections) rehearsal for a play is not recreative, but is practically another and a difficult lesson. This objection is a real one but the danger may be minimized by restricting a given pupil to one play a year, and by excluding from the play students whose scholarship is weak. The notion that the good actor is a poor student is seldom borne out by the facts; in nine cases out of ten brains will tell, on the stage as in the classroom. And good students find the dramatic work mentally stimulating; indeed, in my experience, the better actors are not infrequently at the end of the year found in the small group of honor students.

A second objection arises from the bitter feelings dramatics sometimes arouse; vanity, sensitiveness, jealousy, fraternity rivalry. These feelings are bound to arise whenever the play is managed by a social clique, and particularly when the cast is chosen by popular vote or by a student committee. The pupils must feel that parts are assigned on a basis of merit, preferably by competition; and that at least one of the judges is both experienced and unprejudiced. Indeed, difficulties are constantly arising, in getting up an ambitious play, that require the judgment of an older person than the students themselves. There must, then, be a teacher or a graduate of the school on the committee.

A third serious difficulty is the antagonism that sometimes arises between pupils and teachers over details of management. If the teachers hold themselves aloof and merely act as critics of the plans of the student committee, such troubles are bound to arise. There should be from the start a teacher acting with the students; by becoming a promoter of the play, instead of a censor, he can from the first steer them away from the kind of difficulty that might cause friction if it were ever allowed to arise. In the Horace Mann School, since the consolidation of the students' and teachers' committees into a single board, we have never had any hard feeling on the dramatic question. Indeed, so far has the opposite spirit prevailed that very commonly pupils disappointed at not being cast for a part offer cheerfully to help in such necessary but inconspicuous positions as prompter, property-man, or waitress at the supper given to the actors.

The first objection, then, is answered by restricting play-acting to students of sound scholarship; the others, by hearty co-operation of an experienced teacher.

What the functions of this teacher should be, as I have worked them out in a dozen years' experience, I shall try to suggest in the remaining paragraphs.

He should secure from the principal absolute freedom from interference; nothing is so disastrous as a conflict of authority. This should involve, however, the right to ask for assistance

from other teachers if needed. He should be the last court of appeal: the deciding voice regarding expense, choice of play, of actors, and all other details.

He should see that the committee of students in charge of the play really represents the student body as a whole, and not some fraternity or clique. Having secured a trustworthy committee, he should work as much as possible through them, by advice or suggestion, giving his absolute decision only when imperatively needed. He should have this committee appoint a large staff of subordinates, each with definitely assigned duties, and each responsible to one member of the committee, who may appropriately hold the titles of stage manager, business manager, and social manager.

With the committee he should hold trials of actors. Every encouragement should be held out to bring forward unsuspected talent. Competitors should read or recite anything that gives them an opportunity to get out of themselves; such as, a Beatrice Hereford monologue; a scene from "The Rivals;" a bit of dialogue from Dickens or Jane Austen. They should be warned to avoid oratory, serious poetry, or (unless trying for a dialect part) dialect. The judges should note each candidate's voice, presence, facial expression, pantomine, sense of humor, ability to make points effectively, and to sustain the character represented; and should classify the possible actors as lead, character, comedy, heavy, etc. Such a list will often point to a particular play.

The teacher in charge should assist in the choice of a play, not by insisting on any one play, or even any type of play, but by putting before the committee a list of plays suitable for them to produce. This will save the committee the great and usually fruitless labor of reading plays at the publishers, a depressing task for anyone, and one for which a students' committee is wholly unqualified.

Three kinds of plays I have found available for high-school work. For the younger pupils, before the age of self-consciousness, original dramatizations of whatever they happen to be reading, as "The Christmas Carol." This is so general a

practice in the grades that we need not discuss it further here. For pupils in the middle years, the short farce or comedy, acting from twenty minutes to an hour, easily rehearsed in two or three weeks, and played perhaps before a school club. For the senior class—or preferably for a cast picked from the whole school—a three- or five-act comedy, if possible of literary standing, and avoiding sentimentality on the one hand, and vulgarity or sophistication on the other. The following are some of the most successful plays for amateurs that I know. I have tried to specify any special difficulties in filling the cast or staging the play:

SHORT PLAYS (UNDER AN HOUR)

The Obstinate Family. Three male, three female parts, all well characterized. The best acting short comedy I know.

Barbara. By Jerome K. Jerome. Two male, three female. Girl acting title rôle should be able to work from comedy to sympathetic part. Very pretty play.

The Sleeping Car. W. D. Howells. Like others of the Howells farces —*The Mouse Trap, The Albany Depot, The Register, The Elevator*—this requires some ingenuity in the staging, and the plot is weak. But they all have the rare distinction of humorous dialogue, real characterization, and novel situation.

A Proposal under Difficulties. J. K. Bangs. Two male, three female. The most actable farce in his volume entitled "The Bicyclers;" wholly impossible situation and lines, but very amusing.

A Box of Monkeys. Esther B. Tiffany. Two male, three female. A rollicking farce, with an absurd take-off of Americanisms, acted out to shock an English visitor. Other farces by the same author are full of whimsicality and good acting quality; e. g., *The Way to His Pocket.*

Rosberry Shrub, Sec. Frank C. Drake. One male, three female. Two well-contrasted old-lady character parts; above the usual short play in reality and humor of characterization.

Ici On Parle Français. T. J. Williams. Three male, four female. Lively farce, if acted fast. Good extravaganza parts, especially the Englishman talking French and the Frenchman talking English. More effective if costumed about 1860.

The Revolving Wedge. Thornton M. Ware and George P. Baker. Five male, three female. Exceptionally well constructed and actable college play: the conflict between the Thanksgiving game and the Thanksgiving dinner. Characters good.

A Straw Man. Edward Aborn. Three male, two female. Garden

exterior. Effective and easy farce verging towards horse-play. A straw dummy is dressed in the clothes of one of the boys, and absurd complications follow.

Box and Cox. J. M. Morton. Two male, three female. Two costumes (could be home made). An old favorite; demands only sense of fun and quickness; must go very fast.

MEDIUM LENGTH (ONE TO TWO HOURS)

My Lord in Livery. Three male, three female. Three costumes. Very taking farce of mistaken identity; the young naval officer disguised as footman, and the heroine as waitress. These two must dance minuet, and another girl play piano.

A Pair of Spectacles. Sidney Grundy. Eight male, three female. Needs two good comedy men for Goldfinch and Uncle Gregory, the optimist with gold spectacles and the pessimist with steel, who exchange spectacles and opinions.

Sunbonnets. Marian D. Campbell. (Girls only.) Good New England character play; dialogue and situations clever. Requires big stage and thorough drill.

The Ladies of Cranford. Mary B. Horne. (Girls only.) The best parts of Cranford centering about Miss Matty. Full study of the book needed for details of local color.

LONGER PLAYS (FULL EVENING)

SHAKESPERE. Some of the comedies are well suited to schools, especially if only the important scenes are given. They should be handled not too academically or they will drag. The most available are *Twelfth Night, A Midsummer Night's Dream,* and *The Merchant of Venice.* The staging is expensive, on account of scenery and costumes.

GOLDSMITH. *She Stoops to Conquer.* Rather hard to stage; large cast and frequent changes of scene. Action not difficult; lines and situations so good that the play almost acts itself. A good Tony is needed, who can appear spoiled and vulgar, and still a good fellow. Mrs. Hardcastle's rage and terror must be laughable, not serious. *The Good Natured Man* is also actable, if the poorer scenes are cut.

SHERIDAN. *The Rivals.* Similar to *She Stoops to Conquer* in difficulty of staging and excellence of effect; the characters act capitally, and are not difficult. Use Jefferson's acting edition, in three acts, omitting the tiresome Julia-Faulkland scenes. These two plays I consider by far the most worth while for a school cast.

SCHILLER. *Der Neffe als Onkel* (translated under the title *"Uncle or Nephew?"*) Eighteenth century French. Brisk comedy of mistaken identity; the nephew, spurred on by a clever servant, outwits the crusty uncle. Boys taking these two parts must look alike.

PINERO. *In Chancery, Dandy Dick, The Magistrate, The Amazons,* are all given in schools; they are extremely clever, novel in situation and dialogue, and brisk in action. They have, however, a touch of cynicism which young people are apt to over-act unpleasantly. They must be played lightly.

DICKENS. *The Cricket on the Hearth.* (Jefferson's version). This can be very successful if well done; it is much more difficult, though, than a comedy, as so much sentiment is involved.

SIMPSON. *A Scrap of Paper.* An old favorite with amateur clubs. The plot turns on the possession of a forgotten love letter, which may cause trouble. The leading girl has one serious scene requiring skilful acting.

DAILEY. *A Night Off. 7-20-8.* These farces are essentially the same; rollicking good fun, full of absurdity of character and situation. They are easy to act and will succeed where a comedy of more literary merit is impracticable.

BYRON. *Our Boys.* Excellent standard comedy of the semi-romantic type. Demands one boy who can make the audience first despise and then admire him.

LLOYD. *The Woman Hater.* Good comedy parts, well distinguished; situations ingeniously absurd, especially when the "woman hater" finds himself engaged to three widows at once, and in the final scene where everyone thinks everyone else insane.

I have found it useful to have half a dozen possible plays always on hand, and then select one after the competition for parts. It saves time to build up, at trifling expense, a little dramatic library of say a hundred plays.

After the selection of the play, the teacher-assistant should assume charge of rehearsals, which the cast will enjoy better if held sharply to work. He should keep in touch with all the committee members and their appointees, settle their difficulties, audit their accounts, and assure himself that each deputy will have his task done at the proper time. Throughout, he should act as general lubricator of the wheels; and especially as a warder-off of discouragement or hurt feelings. And when the performance is over, he should have the reward not merely of a company enthusiastic for the moment, but permanently strengthened in character and bound together in friendship for each other and loyalty to their school.

DISCUSSION

TESTING HIGH-SCHOOL PUPILS' KNOWLEDGE OF THE BIBLE

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Mr. Dorey's very interesting article in the December number of the *School Review* stimulated me to try a similar experiment with our young people, the results of which are given below. The questions were given to the Senior class (which averages eighteen years) at its regular period for English. The class, consisting of fifty pupils, is in two sections, and I therefore divided the list of allusions into two parts. For Mr. Dorey's number five I substituted this quotation from "As You Like It":

> Marry, his kisses are Judas' own children.

The others I took verbatim as Mr. Dorey used them.[1] Section 1 of the

[1] List of biblical allusions used in the test:

1. "Or memorize another Golgotha."
   —*Macbeth*, Act I, scene 2, 1, 40.
2. "Here feel we but the penalty of Adam."
   —*As You Like It*, Act I, scene 1, 1, 5.
3. ". . . . . the great King of Kings
   Hath in the tables of his law commanded
   That thou shalt do no murder."
   —*King Richard III*, Act I, scene 4, 1, 200.
4. "And that one talent, which is death to hide
   Lodged with the useless."
   —*Sonnet*, "On His Blindness."
5. "Marry, his kisses are Judas' own children."
   —*As You Like It*, Act III, scene 4, 9.
6. "Through this concession my full cup runs o'er."
   —*The Ring and the Book*, Book IX, 1, 148.
7. "How bloody Herod slew these innocents."
   —*The Ring and the Book*, Book IX, 1, 136
8. "Follow Light and do the Right, for man can half control his doom—
   Till you see the deathless angel seated in the vacant tomb."
   —"Locksley Hall, Sixty Years After."
9. "And from a heart as rough as Esau's hand."
   —"Godiva."
10. "Than that earth should stand at gaze, like Joshua's moon in Ajalon."
    —"Locksley Hall."

class exhausted its five questions in the 45 minutes, and took two more; Section 2 was only able to cover five. The result follows:

Allusion No. 1 was given to 50 pupils; 15 answered correctly, 12 incorrectly, 23 omitted it entirely; percentage of correct answers, 30.

No. 2 was given to 23; 18 correct, 3 incorrect, 2 omitted; percentage of correctness, 78.

No. 3 was given to 23; 21 correct, 2 incorrect; percentage of correctness, 91.

No. 4 was given to 23; 7 correct, 8 incorrect, 8 omitted; percentage of correctness, 30.

No. 5 given to 27; 14 correct, 5 incorrect, 8 omitted; percentage of correctness, 52.

No. 6 given to 27; 17 correct, 3 incorrect, 7 omitted; percentage of correctness, 42.

No. 7 given to 50; 21 correct, 21 incorrect, 8 omitted; percentage of correctness, 42.

No. 8 given to 27; 13 correct, 6 incorrect, 8 omitted; percentage of correctness, 48.

No. 9 given to 27; 6 correct, 11 incorrect, 10 omitted; percentage of correctness, 22.

No. 10 given to 27; 7 correct, 8 incorrect, 12 omitted; percentage of correctness, 26.

The percentage of correctness for the whole list would thus be about 48, coinciding very closely with Mr. Dorey's result. By marking the papers as I would any set of examination papers, I get an average of 53.1 per cent. in one section, and 50.6 per cent. in the other; but I gave credit here for a good deal of rather vague expression, which accounts for the higher average.

The individual averages ran all the way from 0 to 100. Only one made 100; two, between 90 and 100; three, 80 to 90; eight, 70 to 80; four, 60 to 70; eight, 50 to 60; ten, 40 to 50; three, 30 to 40; five, 20 to 30; five, 10 to 20; one 0.

Of the 27 who undertook the discussion of No. 6, 14 named the psalm as the twenty-third, and one called it the Shepherd Psalm. Not one identified the commandment in No. 3 as the sixth.

Some of the "gems":

Peter betrayed Christ if Judas didn't, and if Peter was Judas' son the simile would be better explained.

Herod slewing the innocents refers to the time when all Christian babies under two years of age were to be killed.

The salms were written by Solomon.

Joshua gazed at the moon and had a dream or vision of some kind.

Esau had a twin brother who was the older of the two.

Golgotha was one of the bloodiest battles in Bible history.

The poor woman who had only one talent to give to the Lord.

Golgotha was where Samson slew the Philistines with the jawbone of an ass.

When sin came into the world, the days changed from extreme heat to extreme cold, which was the penalty of Adam.

Golgotha was the leader of the giants who inhabited the promised land before the Isrealites came to it.

The Ten Commandments were made by Christ and he gave them to his disciples and the people.

Golgotha was a heathen god to whom the people offered living sacrifices.

A rumor came to Herod that the child Joseph should become king.

Esau sold his birthright for some porrige.

New York City, January 4, 1909

To the Editor of the "School Review":

Two recent articles in the *School Review,* one by Professor Charles Knapp, and the other by Mr. G. H. Browne, have referred favorably and unfavorably to my recently published *Vocabulary of High-School Latin,* and inasmuch as my attitude has not been made clear in these articles I should like very much to state it briefly if you can find room for it in your pages.

1. Prescription of vocabulary is as logical as prescription of forms and syntax; the knowledge of the three elements of speech is essential for translation.

2. The prescription of 2,000 words is based on the assumption that the acquisition of 500 words is all that can reasonably be expected in one year in the high school and an ordinary high-school course is four years in length.

3. This prescription does not mean that more than this may not be learned or that the vocabulary of any one year should be limited to only 500 words.

4. My list was made from the authors' read in nine-tenths of the high schools in the country. Mr. Browne's list was made from the study of the whole of Caesar, Cicero, Nepos, Sallust, etc., and it is noteworthy, as he himself admits, that approximately 1,900 of my 2,000 words are words of frequent occurrence in his list. This proves conclusively that these 1,900 words embody nine-tenths of the vocabulary of ordinary Latin.

5. The prescription of such a list does not mean that the high-school teacher must read the authors from which it is drawn. By reason of its fundamental character the high-school teacher has almost unlimited freedom in the choice of material. It was to provide this freedom that my list was primarily prepared.

6. It makes no difference to me what list is prescribed for entrance examinations, provided it is of fundamental value. Before this can be determined a more extensive study of Latin usage is necessary. My book professes only to supply material. The preparation of a definitive list might well be left to some duly appointed body.

GONZALEZ LODGE

EDITORIAL NOTES

THE NEED OF EDUCATIONAL INVESTIGATION

We commented last month on certain radical criticisms on our present school system. Numerous other criticisms, some of them fundamental, are appearing with considerable frequency. In the *North American Review* for September, the results of examinations for entrance to West Point were set forth with the inquiry in substance: If the schools are injuring health and not achieving intellectual results, then is it worth while?

Professor Cattell, in the January *Popular Science Monthly*, challenges the whole school system both in its methods and in its results. We do not accomplish what we pretend to be doing, and in so far as we do accomplish it the result is to do more harm than good. "The school work in arithmetic is of very little use." "The accuracy of spelling secured by school drill is useless." "Nothing much can be said in favor of geography, history, and literature as they are taught, or for such science as here and there appears." The schools set patterns of life which the majority of the pupils cannot follow with benefit to themselves or to the social order. Worst of all, our system is in influence and tendency subversive of the family. It re-enforces rather than offsets the injurious effects of city life for this institution. It sets fictitious value upon book learning, tends to make young people demand impossible standards of comfort for beginning family life, keeps young people at books until past the age when impulse is strong, and leaves them indifferent or averse to marriage. Many of those who marry after going through our school system have either no physiological ability or no mental disposition to have children. Every teacher should read this article, even if he may regard it as seeming to charge up to the schools faults due primarily to economic and social changes.

Other questions now coming to the front are those of the retardation of children and the causes for it, the early elimination of children from school, the best technique of reading and of writing, the relation of special training to general ability. The colleges, too, have troubles of their own, and such books as those of Birdseye and Flexner are calling attention to them.

It is needless to say that we do not refer to these questions just now for the sake of discussing them. Our whole point is rather that most of them, at least those which refer to processes and methods, are not subjects for discussion at all. They are matters for investigation. Fundamental questions of ends should be thought over and discussed, but even these are not to be settled without scientific method; on questions of process and

means it is in most cases fruitless to present opinions save as discussion sharpens the issue, focuses attention upon the right point, and then gains a hearing for the results which investigation may reach.

THE AGENCIES ENGAGED IN INVESTIGATION

Many types of agencies are already at work, or are being established for studying these and similar problems. The busy teacher can scarcely be aware even of them all, except as they invade him with questionnaires or subject his pupils to various tests. It may be worth while to mention some of these, as the recent meetings at Baltimore of the American Association for the Advancement of Science brought them together.

First was represented an agency closely related to the general school system itself. Commissioner Brown, as retiring vice-president of Section L, organized last year for the special study of educational problems, represented the national government. Investigations by the Bureau of Education have thus far been limited mainly, on account of meager appropriations, to the gathering of statistics. But the National Education Association last summer voted to suspend its own policy of investigations through committees and throw its influence in favor of legislation to enable the Bureau to carry on such investigations. The study of elimination made by Professor Thorndike for the Bureau the past year is illustrative of the work which this agency is perhaps better fitted than any other to undertake. We believe thoroughly that the Bureau ought to be given means for work on a far larger scale than at present. Closely related to the school system also is another agency, represented on the programme at this meeting—the department of child-study, now coming to be recognized as an important part of a great city's equipment. Abnormal or defective children, or those needing some medical attention to sense organs or glands, have received special attention from such a department as that in Chicago, but we may expect increasingly valuable results in various directions as methods and norms are worked out. In this connection may be mentioned also such a special commission as that established in Massachusetts to investigate the need of industrial education. Its work was admirable, and effective because scientifically done.

A different set of workers was represented at the meetings of the American Psychological Association. The university laboratories are giving increased attention to educational problems. Up to this time a disproportionate amount of attention has been given, and necessarily so, to the perfecting of apparatus and the developing of technique. But from the number of educational papers presented and the tone of the discussions it was apparent that the conditions are changing. No dissent was expressed from the view presented by Professor Kirkpatrick that while up to the present time psychological investigation has been important chiefly in the matter of adapting educational work to ages; and while in methods it has contributed almost nothing as demonstration though much in the way of suggestion, we may

reasonably expect much more in the future. Such work as Professor Schwarz has been reporting in the *Review* is indeed an earnest of fruitful effort.

Another type of agency is the independent foundation. This is the latest to enter the field. The Carnegie Foundation for the Advancement of Teaching, though associated in the public mind chiefly with its grants of pensions to college professors, is undertaking important studies of general educational significance. In its effort to define a college it is at once brought into contact with our secondary schools and their systems of units. The General Education Board makes similar inquiries, although it has not as yet published results. In this type belongs also the Russell Sage Foundation which, in investigating the causes of poverty, finds itself forced to examine our schools. In particular it is undertaking a study of retardation.

Finally, to be complete, we should have to recognize such voluntary societies as the Child Labor Committee, which is now urging the establishing of a Children's Bureau at Washington, to consider interests now scattered or unprovided for. And certainly among the numerous bureaus it would be difficult to name one that on the face of it has a more worthy end. Nevertheless the question of the relation of such a bureau to the Bureau of Education ought to be very carefully considered. Would it not be a desirable arrangement to make the Bureau of Education a full department, and organize the Children's Bureau as a special subdivision of it?

Such are some of the types of workers, nearly all of whom, together with teachers not chiefly engaged in educational investigation, are represented in such a gathering as that at Baltimore. As yet we are feeling our way. But we believe that gradually each agency will find what it can do best, and we may look to see a more solid basis laid for educational work. If we can show that we want to do something worth doing, that we know how to set about it, and that we are broad enough in our vision to look beyond our machinery to the larger personal and social welfare, means for investigation will not be wanting.

J. H. T.

BOOK REVIEWS

Our Colonial Curriculum, 1607–1776. By COLYER MERIWETHER. Washington: Capital Publishing Co., 1907. Pp. 301. $2.00.

The purpose of this book is to give a comprehensive account of our colonial curriculum, covering "the entire course from infancy to graduation in college." There are eight chapters, headed: Elementary Course; General College Course; Ancient Languages; Theology and Philosophy; Geography, History, and Modern Languages; Mathematics; Science; and Disputation. Nearly two-thirds of the space is given to collegiate subjects and much attention is paid to the curricula of English and European schools in the seventeenth and eighteenth centuries. The book, therefore, has decided limitations from the standpoint of a systematic presentation of the development of the colonial curriculum, especially with respect to elementary and grammar schools.

One would expect to find in a book of this kind, programmes and curricula of typical schools and colleges at different periods, with interpretative comment and discussion of causes for changes in the curriculum. What we do find is a description of the contents of a large number of textbooks on various subjects, with more or less comment on the meaning and teaching of such subjects. The author usually commences the discussion with some textbook used in Europe or England, perhaps in the Middle Ages. He moves rapidly from one country to another and one period to another, so that the account is somewhat confusing. Attention is centered almost entirely on New England in the seventeenth century. The most important period of development, 1730–1776, is hardly touched upon.

From the standpoint of scholarship much fault can be found. References are given to authorities, to be sure, but the sources too often refer to conditions abroad. Further, references are frequently omitted where most needed. Sweeping statements and generalizations are based on meager evidence or, still worse, no evidence is given, while errors of fact and judgment, and inaccurate quotations are frequent. For example, lacking contemporary sources for an account of actual conditions in the colonial schools, the author imports descriptions of conditions and methods in use in English and European schools. He confidently asserts that such were typical in the colonial schools. There is an account published in 1867 (p. 73) of work in the Westminster grammar school "about" 1620. A description of a classroom scene in Basedow's school (1774?) quoted from Kemp's *History of Education*, p. 266, revives for us, in the author's opinion, the conditions in our colonial schools, "almost as realistically as the vitagraph and phonograph could" (pp. 72–75).

The account of the development of the curriculum in the general elementary course (pp. 25, 26), with footnotes, well illustrates the unscientific character of this book. With two references to "Dilaway's Roxbury," and one each to conditions at Haverhill and Plymouth, Mass., and Providence, R. I., all at different periods, the author attempts to show the general development of the curriculum for the whole colonial period in all the colonies. The statement (p. 26) that

in Plymouth Latin was added as a subject in the *elementary* course may be put beside another fiction (p. 68), that the *elementary* schools "provided for generally by law in New England were mainly to teach Latin." This is a confusion between elementary and grammar schools which is unpardonable in a work of this character.

The account of the development of the subjects of spelling, writing, and ciphering is inaccurate and inadequate. The author thinks there was no regular spelling-book in use "up to perhaps 1700, or even later." Not only were numerous spelling books printed in England between 1600 and 1700, many of which must have been imported, but Stephen Day, of Cambridge, Mass., printed "Spelling-Books" between 1642 and 1645. In the inventory of the stock of Michael Perry, 1700, a Boston bookseller, there are mentioned "12 Strong's Spelling bookes" and "20 Young's Spelling bookes" (see Littlefield's *Early Schools and School-Bookes of New England*, pp. 118, 127). In the account of Cyphering (p. 36) important statements and generalizations are made, respecting the practice and extent of the study of arithmetic, but not a shred of evidence is produced in support of these statements.

Certain features of the book are praiseworthy. The author has brought together a large amount of information on textbooks used and has given some notion of their nature and contents. His descriptions of certain collegiate subjects are good—for example, science at Harvard. The curriculum at Harvard, however, is overemphasized, while little is said concerning that of other colleges founded before the Revolution.

The book is marred by the use of inelegant and slang phrases, introduced with the evident intention of catching the popular ear. For example, "Martin Luther had a rough tongue and he could take a swipe with it at the ecclesiastical armor of protection" (p. 88). Again "A voracious gosling was Porta, greedily swallowing anything that had Latin or Greek mold on it" (p. 185).

The history of the colonial curriculum is complicated and good contemporary sources are difficult to find. It is therefore particularly desirable that the canons of modern historical criticism should be applied to this subject. We have too many histories and studies which are remarkable for the number of statements unsupported by evidence, and for generalizations for which there is no good basis. There is great need of scientific and exhaustive monographs on various phases of American education, based on prolonged and extensive research in the sources.

M. W. JERNEGAN

THE UNIVERSITY OF CHICAGO

High-School Algebra. Advanced Course. By PROFESSOR H. E. SLAUGHT AND DR. N. J. LENNES. Boston: Allyn & Bacon, 1908. Pp. vii+194. $0.75.

Anyone who had read the first volume (Elementary Course) of this algebra must have awaited the appearance of the second volume with some interest. The elementary course measured up in a large degree to its avowed purpose, but it was obviously insufficient. Much of what one felt to be lacking in the first volume is contained in the advanced course, and the two combined make

a very complete treatment of the subjects covered. The question as to the wisdom of presenting the subject in two distinct courses is one upon which a theoretical opinion would be of little value. It will be settled in due time by practical experience.

Among the strong features of the book one notes the careful treatment of equivalent equations, and the repeated warnings to throw out results which do not satisfy the original equation. In this connection, the student is frequently reminded that there is no such thing as division by zero. Even some teachers may need to be reminded that $x=1$ is not a root of the equation

$$\frac{4x}{x^2-1}-\frac{x+1}{x-1}=1.$$

On the other hand, the statement (p. 159) that $x=-1$ does not satisfy the equation

$$\sqrt{x+5}=x-1$$

is very questionable. Why should the authors introduce the excellent notation $|\sqrt{x+5}|$ if it is not to be used to prevent ambiguity in just such cases. We all agree at once that $x=-1$ does not satisfy the equation

$$\sqrt{x+5}=x-1,$$

but I believe it is in conformity with the general usage to say that both 4 and -1 are roots of the equation as given.

In line with the marked tendency of most of the recent texts in elementary algebra, graphs are used very freely in the study of equations. This not only throws a helpful light upon the algebraic processes, but it lays an excellent foundation for the study of analytic geometry. But caution must be exercised at this point. The solution of simultaneous equations in two variables, even when the equations are linear, can, in general, only be *approximated* by measuring the co-ordinates of the point of intersection of the graphs. It should be made very clear that the really important method of solution is the process of elimination; and that, while the graphs may throw much light upon the solution, they do not furnish a method of solution.

The early introduction of the factor theorem and of the idea of solution of equations by factoring is most commendable.

The authors have treated the subject of variation clearly, and have given it the prominence that it deserves. Other textbooks are doing the same; and if students continue to come up to college with only the vaguest notions upon this most important and very simple subject, the fault will lie with the teachers.

The definition of irrational numbers is not quite rigorous. It is not shown that $\sqrt{2}$, for instance, "can be approximated by means of integers and fractions to any specified degree of accuracy." It *is* shown that one can find fractions whose squares will approximate 2 to any specified degree of accuracy—which is a different matter. The definition, to fit the context, should read:

If a number is not the kth power of an integer or a fraction, but if one can find integers or fractions whose kth powers will approximate the number to any specified degree of accuracy, then the kth root of such a number is called an *irrational number.*

The statement at the beginning of the chapter on logarithms that "the

operations of multiplication, division, and finding of powers and roots are greatly shortened by the use of logarithms" needs qualification.

The use of S_n instead of S to denote the sum of n terms of a progression will clear up part of the trouble which sometimes arises at this point; but the use of the phrase "last term" and the corresponding letter l also causes confusion. It still remains for some bold author to replace the l in such formulae as

$$l=a+(n-1)d$$

and

$$S_n=\frac{rl-a}{r-1}$$

by a_n.

The proof by induction of the binomial theorem for positive integral exponents ought to be made complete. To the best of the present writer's knowledge, this has not been done in any elementary algebra. It is only necessary to show that the sum of the coefficients of the rth and $(r+1)$th terms in the expansion of $(a+b)^n$ is equal to the coefficient of the $(r+1)$th term in the expansion of $(a+b)^{n+1}$, which is a step not at all too difficult for a textbook of this grade.

But when one has said the worst that can be said about the book, the fact remains that the defects are neither numerous nor serious; and that in many important respects, it sets a new and higher standard for high-school algebras.

WALTER B. CARVER

CORNELL UNIVERSITY

Select Translations from Old-English Prose. Edited by ALBERT S. COOK AND CHAUNCEY B. TINKER. Boston: Ginn & Co., 1908. Pp. viii+296. $1.25.

The well-known doggerel lines about Anglo-Saxon,

> "All are dead who spoke it;
> All are dead who wrote it;
> All are dead who learned it;
> Blessed death! They earned it!"

voices the general opinion regarding the literary virtues of Old-English literature, and the particular opinion of those who have toiled through the linguistic difficulties of our earliest mother-tongue. Nevertheless, an acquaintance with this literature should form an indispensable part of the knowledge of every student of comparative literature, of folklore, of English political, religious, legal, social, and literary history. Many students turn away from the laborious course of digging this knowledge out of the original tongue, and many dislike plodding through the time-honored translations in Bohn's libraries to separate the chaff and the grain. To garner the good of this voluminous literature requires no little effort and no small knowledge. These virtues, combined with sympathy and insight, mark the volume entitled *Select Translations from Old-English Prose.* The editors, encouraged by the favorable reception of a previous volume of selections from Old-English Poetry, have increased their credit with students of Old-English literature by compiling this volume. The book is made up of excellent translations, both selected and original, from the more interesting and valuable parts of Bede's *Ecclesiastical History;* from the *Old-*

English Chronicle; Asser's *Life of King Alfred;* from *King Alfred's Works: Ælfric's Homilies;* the aprocryphal *Harrowing of Hell*; the romance of *Appollonius of Tyre*, and other productions of early English writings. Prefaces to each section, notes, and an unusually good index make the volume an acceptable accessory for even the learned in Old English, and exceedingly helpful to the unread in our early English prose. These two volumes, the *Select Translations from Old-English Poetry*, and the volume on prose, will be of great worth to all teachers of English history and of English literature. Teachers of secondary English will find much excellent supplementary reading in the two books.

H. E. Coblentz

South Division High School
Milwaukee, Wis.

Elements of Plane and Solid Geometry. By Allen Sanders. New York: American Book Co. Pp. 384. New edition (unchanged).

As a basis for work in geometry this is an excellent textbook. The order of the theorems is well chosen; and parts of the demonstrations are omitted so that the pupil must to some extent use his own reasoning powers. The constructions, as erecting perpendiculars, bisecting a line, etc., are given early, and the teacher may thus have the pupils do considerable work in mathematical drawing and constructions, which is a valuable part of the geometric work. The chief point of excellence in this book is that each theorem is followed by several simple exercises bearing directly upon the principle of the proposition. They give the pupil practice in numerical computation, mathematical drawing, and devising geometric proofs of easy theorems.

But, in the opinion of the writer, it is only as a basis of work that this textbook should be used. The advisability of attempting the proofs of theorems in the theory of limits in elementary geometry has been widely discussed during the past few years; and the articles by Hedrick, Hawkes, Lennes, Greenwood, and others in *School Science and Mathematics* show that the proofs usually given are not rigorous, and that it is not the part of wisdom to present proofs which cannot be understood nor appreciated by the pupils in elementary geometry. Moreover, this textbook, in common with others, has little or no connection with the rest of the domain of mathematics, and with the ordinary, everyday life and knowledge of the pupil. *Geometric Exercises for Algebraic Solution* by Professor Geo. W. Myers is a revelation of the direct and simple way in which the year given to geometry may be made of vastly more value to the average pupil. By the omission of unnecessary theorems and the proofs in the theory of limits there is time for algebraic problems which will give the pupils a stronger grasp on algebra and a better working knowledge of geometry. The teacher who uses Sanders' *Geometry*, adding algebraic and practical problems and exercises, will find that he can do very satisfactory work.

H. E. Cobb

Lewis Institute
Chicago, Ill.

The Elements of English Grammar. By GEORGE PHILIP KRAPP, Columbia University. New York: Scribner's, 1908. Pp. 271. $0.80 net.

There are many good things in this book, as one may see at a glance who has ever been tempted to write an elementary English Grammar. No language is so superior to its grammar as the English, and the teacher of English has no more difficult task than to make clear to beginners grammatical definitions and grammatical distinctions. It is, perhaps, this standing challenge that lures many a man, trained or untrained, novice and expert alike, to try his hand at it.

But while there is much that is good, there is also much which might so easily be better that one lays the book down, in the end, with a feeling of disappointment. For instance, turn to the treatment of "Transitive" and "Intransitive Verbs" (pp. 129, 130). Reversing the order, I take up the "Intransitive" first: "An intransitive verb is one in which the action of the verb does not pass over from the subject causing the action to an object immediately affected by the action, but in which the action is completely expressed by the subject and predicate. Intransitive verbs, therefore, do not have objects." For a definition of that length could anything be better?

Now let us turn to "Transitive Verbs": "A transitive verb is one in which the assertion of the verb passes over from one person or thing, the grammatical subject, from which or whom the action proceeds, to another person or thing, the grammatical object, which is directly affected by the action of the verb. Every sentence which contains an object must contain a transitive verb." Could anything, I ask this time, be worse? The definition is repeated under a "Summary of Definitions" on p. 190. In the example given, "The hunter *shot* the squirrel," it is, evidently, not "the assertion" that passed over from the subject to the object "directly affected"—squirrels are not killed that way. And in the next example, "Charles *whistled* a tune"—isn't *tune* the object *effected?* If so, then the example should come under "Cognate Object," on the next page, along with "The boys *ran* a *race.*" With respect to objects, between "The boy whistled a tune" and "The dog bit the boy" there is a painful difference.

Under "Cognate Object" a new grammatical principle is introduced: "Some verbs which are usually intransitive become transitive when they are followed by an object of like meaning. This object is called the Cognate Object. Examples: He *sleeps* (intransitive); He sleeps the *sleep* of the just (transitive)." If this be true, the definitions of the preceding page fall to pieces. The addition of the cognate object does not make the verb transitive; *sleep* is the object *effected*, the act is still confined to the subject, and the verb remains intransitive. The object most "directly affected" by the action of the verb is the passenger in the next berth, who hears the just man "letting off sleep," and prays for a collision.

Under "Imperative Mood" (187), among genuine examples, are found: "God *grant* you prosperity," "So *be* it," which are not of this mood at all, but subjunctives. Under "Mood" (184) the author says "the question of mood is of importance only in those few occurrences of the subjunctive in which a separate form is used to indicate the subjunctive." This, then, is of importance, as the indicative would be "God grants" and "So it is," the imperative being out of the question. Grammarians seem to vie with one another in their endeavor to com-

pose a fitting epitaph on the English subjunctive, but, in the meanwhile, the English subjunctive continues to be quite lively—for a corpse—as, witness these two that got in the wrong box.

Under "Verb Phrases with *had*" is the example, *"He had better not come at all than come too late,* or *He would better not come at all than come too late."* So *would better not come* has won recognition at last! It has long since been "newspaper English," and might still serve as a useful example of "schoolmaster's English," the kind that parses easily and adapts itself readily to the Diagram, that Apollyon of effective idiom. It must needs be that offenses come, but the woe, I thought, had been pronounced only against the diagrammarians of America. The *New English Dictionary* (under "Better") devotes a paragraph to *had better,* but there is no hint of any *would better.*

Verbs are classified as "Regular" or "Irregular." Regular verbs are said to be formed "by adding *-d* or *-ed* to the uninflected form of the present;" and yet *hear* is found in the list of irregular verbs! Ought not grammarians to show faith enough in their own rules to follow them?

The grammar closes with a chapter on "Analysis and Diagram," in which are displayed the familiar pitchforks and grasshopper skeletons.

EDWARD A. ALLEN

COLUMBIA, MO.

A Selected List of Plays for Amateurs and Students of Dramatic Expression in Schools and Colleges. By S. A. MCFADDEN AND L. E. DAVIS. Cincinnati, 1908. Pp. 96.

With the growth of interest in the drama among high schools and colleges has come a demand for plays suitable in moral tone and literary distinction for amateur production. To everyone, therefore, interested in amateur acting *A Selected List of Plays,* compiled by Elizabeth A. McFadden and Lillian E. Davis, will be a great boon. In this book are contained the names of some five hundred plays, with the name of the publisher, the price, a brief description of the nature of the play, the number of characters, and, in a word, just the information needed for the intelligent selecting of a play. The book is on sale by Miss McFadden, Box 328, Cincinnati, Ohio.

S. H. CLARK

THE UNIVERSITY OF CHICAGO

The Demonstration Schools Record. Edited by J. J. FINDLAY. Manchester: The University Press, 1908. Pp. 126. Price, 1*s.* 6*d.* net.

This is the second number in the "Manchester University Educational Series," the first of which was Dr. Sadler's *Continuation Schools in England and Elsewhere.* The editor of the present number, Professor Findlay, has been active in bringing to English schools the results of the work of two men who have influenced him professionally—first, as an outcome of his studies at Jena—Herbart, and, later, Dr. Dewey. In the first volume of the University of Chicago *Record* is published an address at Chicago by Professor Findlay in which he recalls Kant's interest in the idea of an experimental school and discusses the need and possibilities of that phase of school activity. Recently he has brought together in a small shilling book a representative collection of

Dr. Dewey's educational essays. It is to be hoped that this may be done in America as well at an early date. Professor Findlay now holds the Sarah Fielden professorship in education at the University of Manchester. The *Record* now issued includes in an appendix an account of the educational services of Mrs. Fielden for which she was given the degree of Litt.D. by the University of Manchester. In a second appendix is given an extract from the trust deed and by-laws of the Fielden school. Details of organization are carefully stated, so that other institutions moving in the same direction can easily profit by the present experience. The statement is suggestive to Americans of how much wise management can accomplish with comparatively small sums of money.

The book opens with an introductory note in which is stated the plan of a series of publications "to acquaint subscribers and others interested in education with the work of these two demonstration schools, and with the nature of the investigations which center around them." These schools are laboratories for the use of the department of education. Attention is called to the reports of similar undertakings at Jena, Chicago, Teachers College (Columbia), and Armstrong College. Then follow seven sections on "The Study of School Children," "Study of Curricula and Method," "The Syllabus of Science Teaching," "The First Year's Course in French," "Problems in the Corporate Life of School," "The Control and Financial Support of Demonstration Schools," "Handwork in History Teaching." Several members of the department and of the schools contribute, among them Dr. Sadler who co-operates in the last section, adding material from the course of the Village Hall School at Weybridge, Dr. Sadler's home. This inclusion of work from other schools illustrates the broad scope of the plan. A part of the first section is by Professor H. Thistleton Mark, whose extensive study of experimental and other schools in America a decade ago brought him into close acquaintance with many school workers.

It would be interesting to discuss details of this work but one needs to get at it first-hand. The influence of Dr. Dewey is evident throughout, but the intention is clear that these schools shall be rather more conservative than was the Chicago school. The "correlations" of Professor Findlay's Herbartian days are somewhat in evidence.

Knowing the amount of material in physical measurements collected by some schools that has been shown to be practically worthless because not properly taken, one cannot but regret that this school is not starting off its measurements with as scientific precision as present-day knowledge affords.

The sections dealing with the various subjects are suggestive but their value will be more evident in later reports. The chapter on "The Corporate Life of School" is perhaps the most significant. A very democratic spirit is shown in the organization of life within the school and in the recognized function therein of the parents as individuals and as a body. The account of the exodus of the school to the country for a fortnight each summer shows an advance movement and an intelligent appreciation of the problems and possibilities of this development.

FRANK A. MANNY

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BOOKS RECEIVED

EDUCATION

Journal of Proceedings and Addresses of the Forty-Sixth Annual Meeting of the National Education Association, held at Cleveland, Ohio, June 29–July 3, 1908, Published by the Association, Winona, Minn., 1908. Pp. 1,251.

University Administration. (The N. W. Harris Lectures for 1908.) By CHARLES W. ELIOT. Boston: Houghton, Mifflin & Co., 1908. Pp. 266. $1.50.

Studies in the History of Modern Education. By CHARLES OLIVER HOYT. New York: Silver, Burdett & Co., 1908. Pp. 223.

State Control of Courses of Study. By FRED J. BROWNSCOMBE. New York: Silver, Burdett & Co., 1908. Pp. 125. $1.00.

Questions Set at the Examination Held June 15–20, 1908, by the College Entrance Examination Board. Boston: Ginn & Co., 1908. Pp. 127.

A Patrons' Meeting. An Address to the Patrons of the Danville (Ill.) High School by the Principal, Z. M. SMITH, November 9, 1908. Pp. 30.

Report of the Superintendent of Public Instruction of the Commonwealth of Pennsylvania, for the year ending June 1, 1908. Harrisburg, Pa.: Harrisburg Publishing Co., 1908. Pp. 567.

Recollections of a New England Educator, 1838–1908. Reminiscences biographical, pedagogical, and historical. By WILLIAM A. MOWRY. New York: Silver, Burdett & Co., 1908. Pp. 292.

Didaktische Präludien. VON H. GAUDIG. Leipzig: B. G. Teubner, 1909. Pp. 272. $0.83.

Didaktische Ketzereien. VON H. GAUDIG. Leipzig: B. G. Teubner, 1909 (2d edition). Pp. 132. $0.46.

Wisconsin Memorial Day Annual, Lincoln Centennial Number, 1909. Compiled by O. S. RICE, State Library Clerk. Issued by C. P. PARRY, State Superintendent. Madison, Wis.: Democrat Printing Co., 1909. Pp. 100.

ENGLISH

Graded Exercises in Phonography. (To be used in connection with the study of stenography.) By WILLIAM LINCOLN ANDERSON. Boston: Ginn & Co., 1908. Pp. 137.

Composition in the High School the First and Second Years. By MARGARET ASHMUN. *University of Wisconsin Bulletin,* No. 251, High-School Series No. 3, August, 1908. Pp. 56.

LATIN

Livy: Selections from the First Decade. Edited by OMERA FLOYD LONG. Chicago: Scott, Foresman & Co., 1908. Pp. 160.

GERMAN

German Exercise Book with Grammatical Hints. By M. BLAKEMORE EVANS AND EDUARD PROKOSCH. Boston: Ginn & Co., 1908.

Deutsches Aussprachewörterbuch. Von Wilhelm Viëtor. Heft 1, A–biogenetisch. Leipzig: O. R. Reisland, 1908. Pp. 48. M. 1.20.

SPANISH

Pedro Sánchez. By D. José M. de Pereda. Edited, with Introduction, Notes and Vocabulary, by Ralph Emerson Bassett. Boston: Ginn & Co., 1907. Pp. 379. $1.00.

HISTORY AND GEOGRAPHY

Readings in English History Drawn from the Original Sources. Intended to Illustrate *A Short History of England.* By Edward P. Cheyney. Boston: Ginn & Co., 1908. Pp. 781. $1.40.

Readings in Modern European History, Vol. I, The Eighteenth Century: The French Revolution and the Napoleonic Period. By James Harvey Robinson and Charles A. Beard. Boston: Ginn & Co., 1908. Pp. 410.

In Viking Land—Norway: Its Peoples, Its Fjelds and Its Fjords. By W. S. Monroe. Boston: L. C. Page & Co., 1908. Pp. 332. $3.00.

SCIENCE AND MATHEMATICS

The Freshwater Aquarium and Its Inhabitants. By Otto Eggeling and Frederick Ehrenberg. New York: Henry Holt & Co., 1908. Pp. 352. Illustrated. $2.00.

Plane and Solid Geometry. By Elmer A. Lyman. New York: American Book Co., 1908. Pp. 340. $1.25.

School Algebra, Part I. By W. E. Paterson. Oxford and New York: Oxford University Press, 1908. Pp. 328. $0.60.

MUSIC

The Eleanor Smith Music Course (4 vols.). By Eleanor Smith. Book One, 112 pp., $0.25; Book Two, 145 pp., $0.30; Book Three, 192 pp., $0.40; Book Four, 255 pp., $0.50.

CURRENT EDUCATIONAL LITERATURE IN THE PERIODICALS[1]

IRENE WARREN
Librarian, School of Education, The University of Chicago

BROENE, J. Nietzsche's educational ideas and ideals. Educa. R. 37:55–70. (Ja. '09.)

BROWN, ELMER ELLSWORTH. Unifying influence of industrial art. Journ. of Educa. 68:703–5. (Ja. '09.)

BURR, WILLIAM H. The study of engineering. Col. Univ. Q. 9:42–49. (D. '08.)

BURRUSS, J. A. Industrial factor in public education in the south. South. Educa. R. 5:163–75. (O.—N. '08.)

BUTLER, NICHOLAS MURRAY. Physics teaching in secondary schools. Educa. R. 37:86–8. (Ja. '09.)

CATTELL, J. MCKEEN. The school and family. Pop. Sci. Mo. 74:84–95. (D. '08.)

CLARK, JOHN BATES. Education and the socialistic movement. Col. Univ. Q. 9:28–41. (D. '08.)

COE, GEORGE ALBERT. Moral and religious education from the psychological point of view. Relig. Educa. 3:165–79. (D. '08.)

COHEN, LEON M. SOLIS. Library work in the Brooklyn ghetto. Lib. Journ. 33:483–84. (D. '08.)

CUSHMAN, LILLIAN S. A report of the second annual meeting of the National Society for the Promotion of Industrial Education. El. School T. 9:250–56. (Ja. '09.)

FREEMAN, MARILLA WAITE. The relation of the library to the outside world. Lib. Journ. 33:488–92. (D. '08.)

FURST, CLYDE. The financial status of the professor. Col. Univ. Q. 9:50–54. (D. '08.)

GARD, WILLIS L. Some neurological and psychological aspects. Pedagog. Sem. 15:439–73. (Ja. '09.)

[1] *Abbreviations.*—Col. Univ. Q., Columbia University Quarterly; Educa. R., Educational Review; El. School T., Elementary School Teacher; Harp. W., Harper's Weekly; Journ. of Educa., Journal of Education; Lib. Journ., Library Journal; Out., Outlook; Pedagog. Sem., Pedagogical Seminary; Pop. Sci. Mo., Popular Science Monthly; Psycholog. Clinic, Psychological Clinic; Relig. Educa., Religious Education; South. Educa. R., Southern Educational Review.

HALL, G. STANLEY. Elements of strength and weakness in physical education as taught in colleges. Mind and Body. 15:326–30. (Ja. '09.)

HERTS, ALICE MINNIE. Dramatic instinct—its use and misuse. Pedagog. Sem. 15:550–62. (Ja. '09.)

JONES, ELMER E. A concrete example of the value of individual teaching. Psycholog. Clinic. 2:195–203. (D. '08.)

JUDSON, HARRY PRATT. Religion in the schools. El. School T. 9:223–32. (Ja. '09.)

K., F. P. The Columbia university summer session. Col. Univ. Q. 9:19–27. (D. '08.)

LELAND, CLAUDE G. The world's largest circulating library. Harp. W. 52: 12–13. (26 D. '08.)

MAGRUDER, W. T. The cosmopolitan high-school curricula. South. Educa. R. 5:195–96. (O.–N. '08.)

MARTIN, GEORGE H. Industrial education and the public schools. Journ. of Educa. 68:675–76. (D. '08.)

MCNARY, SARAH J. The preparation of a class for a lesson in literature. Pedagog. Sem. 15:484–91. (Ja. '09.)

MILLER, DICKINSON S. Mr. Roosevelt's opportunity as president of a university. Pop. Sci. Mo. 74:62–69. (D. '08.)

MORRISON, G. B. The high-school situation. South. Educa. R. 5:187–94. (O.–N. '08.)

ORDAHL, GEORGE. Rivalry; its genetic development and pedagogy. Pedagog. Sem. 15:492–549. (Ja. '09.)

PRICHETT, HENRY S. Professional education. Out. 90:870–73. (19 D. '08.)

PUTNAM, HELEN C. Biological knowledge and morality. Relig. Educa. 3:180–86. (D. '08.)

ROARK, R. N. Modern tendencies in education. South Educa. R. 5:149–57. (O.–N. '08.)

Report of the librarian of the Bureau of Education. Lib. Journ. 33:503– (D. '08.)

RUEDIGER, WILLIAM C. The field of education. Pedagog. Sem. 15:474–83. (Ja. '09.)

RUSSELL, JAMES EARL. The call to professional service. Col. Univ. Q. 9:1–9. (D. '08.)

SEERLEY, H. H. Industrial arts in normal schools. South. Educa. R. 5:158–62. (O.–N. '08.)

SHAW, CHARLES FRANKLIN. The educational principles involved in the religious training of young people. Relig. Educa. 3:182–86. (D. '08.)

SHOWERMAN, GRANT. A co-educational meditation. Educa. R. 37:44–54. (Ja. '09.)

SISSON, EDWARD O. The genius of the American high school. Educa. R. 37:29–43. (Ja. '09.)

SOULE, A. M. Work of the agricultural school in the scheme of state education. South. Educa. R. 5:176–86. (O.–N. '08.)

STARR, M. ALLEN. The duties of the medical profession to the public. Col. Univ. Q. 9:10–18. (D. '08.)

STERLING, E. BLANCHE. Gymnastics as a factor in the treatment of mental retardation. Psycholog. Clinic. 2:204–11. (D. '08.)

STOWE, LYMAN BEECHER. School republics. Out. 90:939–48. (26 D. '08.)

Tenth anniversary of the hall club. October 23, 1898. Pedagog Sem. 15:563–79.

TERRY, H. L. The new movement in physics teaching. Educa. R. 37:12–18. (Ja. '09.)

THORNDIKE, EDWARD L. The influence of the number of men teachers upon the enrollment of boys in public high schools. Educa. R. 37:71–85. (Ja. '09.)

THWING, CHARLES F. The answer of the far east to some American college questions. Educa. R. 37:19–28. (Ja. '09.)

WITTICH, GEORGE. Folk-dances as physical training for the young in America. Mind and Body. 15:321–25. (Ja. '09.)

NOTES AND NEWS

The sixth general convention of The Religious Educational Association will be held in Chicago this year, February 9 to 11. Among the speakers at the general sessions, the following have been announced: Francis G. Peabody, President Benjamin I. Wheeler, President Eliot, President-elect C. E. Mitchell, President King, Professor Geo. A. Coe, Professor C. R. Henderson, Miss Jane Addams, and Bishop Lawrence, of Massachusetts. The departmental meetings will be led by an exceptionally strong line of recognized leaders in this general subject.

In the midst of the persistent claims that our high schools need a larger percentage of male teachers in order to increase the number of male students, Professor E. L. Thorndike, in the *Educational Review* for January, presents facts and figures which are of significance. From a study of 204 representative high schools, based upon data furnished for 1906 by the United States Bureau of Education, he concludes:

> In general it is clear from them (the tables compiled) that the addition of male teachers has made very little difference, and very likely none, in the proportion of the male students. The same, but to a less degree, is true in the case of the relation between changes in the sex balance of the staff and the changes in the sex balances of the graduates.

It is announced that Abbott Laurence Lowell has been selected by the corporation as the successor to President Eliot. It had been rumored that Dr. Eliot, in accordance with the general principles laid down in his book on University Administration, would favor the selection of a young man. It is therefore encouraging to teachers who have passed forty that the new president is to be a man of fifty-two years of age.

Under the caption "Progress in Education, 1908-9," the Harvard Teacher's Association Committee on Educational Progress, is sending out a suggestive list of topics, together with a plea to all who are interested in education, to assist them in their self-imposed task of gathering authentic data and practical suggestions upon the topics suggested, or upon others that may come up. The matter is one of such vital importance and of such immediate, practical application, that we present below, the list of suggested topics and the major portion of the plea:

> 1. Extension of scope in education: (*a*) physical education, (*b*) vocational education, (*c*) moral and religious education, (*d*) education with reference to special conditions (i. e., immigrants, truants, Juvenile Courts, defectives), (*e*) new school aims and subjects (i. e., gardens, vacation work, social education).
>
> 2. Organization and Administration: (*a*) relation of teachers to school offi-

cers, (*b*) qualification and status of the teacher, (*c*) articulation of the school system, (*d*) the school programme.

3. Method: (*a*) instruction (i. e., attention to individual, group work, devices, and special methods), (*b*) the learner (i. e., the laboratory principle, constructive activity in school work, direct observation of real data, group work, individual investigation, library work), (*c*) the subject (i. e., organization of teaching material, selection of typical cases and problems, standard books, etc.).

In part the committee urges:

Do you know of progress upon some of the lines suggested, or upon any other line in education? Have you not in hand or in mind data of advance in one direction or another—some late or forthcoming report, some article, investigation, or table? Do you not know of some scheme, device, plan, programme, experiment, investigation, process, or result, in the wide field of educational endeavor, which shows progress in thought or in practice? Can you not give us, in particular, some information as to educational legislation, passed, pending, or proposed? We need authentic information for a report which shall serve to quicken, to guide, and to balance the educational activity of those who are to hear or to read it. Our report for 1908 was printed in the May *School Review*, and a reprint is at your command, if it will help you.

A committee consisting of six college officers and six representatives of schools, with Wilson Farrand as chairman, appointed by the Association of Colleges and Preparatory Schools of the Middle States and Maryland to consider the quantity of college-entrance requirements, reports the four following resolutions:

1. The amount of work that may reasonably be demanded for admission to college is measured by what can be done in an efficient four-year high-school course.

2. In our judgment, better results would be secured in preparation for college if the same amount of work were concentrated on fewer subjects.

3. The minor differences now existing between colleges in the matter of entrance requirements are detrimental to the best interests of education and should be eliminated.

4. In our judgment, criticisms on special subjects are serious enough to call for the careful reconsideration of such requirements by properly constituted committees.

The increasing importance of the place the sciences are taking in the curricula of the secondary schools is emphasizing two important aspects of

the situation as it now stands: (1) the lack of properly equipped and trained teachers; and (2) the inadequacy of the great majority of texts in science for secondary-school pupils. Along these general lines, The American Federation of Teachers of the Mathematical and the Natural Sciences, in a recent Bulletin, makes some helpful comments, which may be assuring to those who are tempted to expect too much, too soon:

> The working into pedagogic form of the new knowledge, and the correlative establishment of teaching laboratories of chemistry, physics, biology, etc., have struggled to keep pace with scientific progress, but naturally without complete success. Educational systems and institutions are proverbially and justly conservative. It has been necessary not only to provide textbooks and laboratories, but to create new methods of teaching, to combat ancient prejudices, to overturn established curricula, to reform administrative systems, to educate a new generation of teachers. Rather let us say these are the changes which have been begun, but of which time has not yet sufficed for the fulfilment. If some have underestimated the extent of the necessary educational evolution, they may have become too easily disappointed at the smallness of the results thus far attained. . . . . Good teachers of any subject are rare, but certainly persons interested in the "humanities" are as yet more numerous than those trained in science; and, it may fairly be added, are less in demand for other professions than teaching. Again, educational administration is still largely in the hands of men of literary traditions, or of men who respect these traditions.

President Angell, in his annual report, comments as follows upon the relation of the general college course to vocational training:

> I am gratified to say that in the past year the largest portion of the increase in attendance is found in the Literary Department. In these days when not a few men in eminent educational positions are advocating very radical measures in what they call vocational education, involving very narrow special training even from early school days for some particular pursuit, I deem it encouraging to see among our constituency a desire for a sound, well-balanced, all-round training, which shall fit men for taking up later an effective special preparation for any one of the several pursuits. A very large proportion of American students do not know in their early years what particular calling they are to follow. One of the valuable features of a college life is to reveal to them what vocation it will be best for them to choose. And even if they do know at the time to begin college life what is to be their calling, the wise thing is for them to lay some broad foundation for their professional studies in wisely chosen courses in the Literary Department.